City of Santa Barbara Mission Creek Bridge Replacements

Biological Assessment

City of Santa Barbara Mission Creek Bridge Replacements, Santa Barbara County

Mason Street Bridge No.51C - 287/ BRLO – 5007 (045)

Chapala Street Bridge No.51C – 0250 / BRLSZD – 5007 (043)

Cota Street Bridge No.51C – 0246 / BRLO – 5007 (044)

December 2010

Caltrans
CALIFORNIA DEPARTMENT OF TRANSPORTATION

STATE OF CALIFORNIA

Department of Transportation

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Summary of Findings, Conclusions, and Determinations

Mission Creek originates on the south slopes of the Santa Ynez Mountains in the County of Santa Barbara, California and passes through the City of Santa Barbara prior to flowing into the Pacific Ocean. It is located within the boundaries of the Southern California Distinct Population Segment (DPS) for the federally endangered steelhead trout (*Oncorhynchus mykiss*) and was originally designated by the National Marine Fisheries Service (NMFS) as steelhead critical habitat on February 16, 2000, a designation that is still in effect. The tidewater goby (*Eucyclogobius newberryi*), a federally listed endangered species, also inhabits lower Mission Creek lagoon in the City of Santa Barbara. Mission Creek was designated as critical habitat by the United States Fish and Wildlife Service (USFWS) for this species on March 3, 2008.

The City of Santa Barbara plans to replace the Mission Creek Bridges at Mason Street (Bridge No. 51C – 287/BRLO – 5007 [045]/ EA:05-930144 and Cota Street (Bridge No. 51C – 0246 / BRLO – 5007 [044]) as part of the Lower Mission Creek Flood Control Project (LMCFCP). The Mason and Cota bridges are classified as Functionally Deficient and they lack adequate hydraulic capacity. The Chapala Street Bridge (Bridge No. 51C – 0250 / BRLSZD – 5007) (043), on Mission Creek is also planned for replacement to meet seismic safety requirements but is not part of the LMCFCP.

The LMCFCP has been proposed to increase the flood-carrying capacity in Mission Creek from 1,050 cubic feet per second (cfs), or 29.4 cubic meters per second, to 3,400 cfs, or 95.2 cubic meters per second, along a mile of Mission Creek located between the mouth of the creek at the Cabrillo Boulevard Bridge upstream to the Canon Perdido Street Bridge (U.S. Army Corps of Engineers [USACE] 2000a). As part of this project, the creek channel will be widened and designated bridges will be replaced in order to accommodate increased channel capacity. In addition, native riparian vegetation will be planted along creek banks and in habitat expansion zones, and suitable habitat for the federally endangered steelhead and tidewater goby will be created by adding pools, boulder clusters, and shaded areas in water of sufficient depth. Other minimization measures for this project include appropriate construction schedule timing and biological monitoring during construction to avoid affects to steelhead and tidewater goby; placement of diversion/dewatering systems prior to work activities; minimization of in-stream disturbance; and a storm water pollution prevention plan (SWPPP) that details best management practices for the project. These measures have been developed cooperatively between the City of Santa Barbara and the State and Federal Agencies participating in the LMCFCP review and approval process.

The NMFS, in a Biological Opinion - August 2, 2000 (Federal File # F-LB-00-23:KAJ), determined that the larger flood control project was not likely to jeopardize the continued existence of the Southern California steelhead and was not likely to destroy or adversely modify designated critical habitat. Similarly, the USFWS concluded in their Biological Opinion

– June 1, 2002 (Federal File # 1-8-00-F-74) that the lower Mission Creek Flood Control Project was not likely to jeopardize the continued existence of the tidewater goby.

This current report assesses whether biological information presented in the LMCFCP Biological Assessments (USACE 2000b, USACE 2000c) is applicable to the current project of replacing three bridges at Mason Street, Chapala Street, and Cota Street. The results of biological surveys at the three bridge sites conducted by ARCADIS in July 2010 verify and update project information gathered to date. This report also addresses key questions posed by the NMFS and USFWS regarding any new project information that would affect species impact analysis; whether there are any additional species listings or critical habitat designations relevant to the project; if original avoidance/minimization measures remain the same; and if Reasonable and Prudent Measures and Terms and Conditions within the Biological Opinions will be followed.

While there are slight project description changes, they are not expected to change the outcome of the species impact analyses. The critical habitat designation for the tidewater goby has been revised since the last agency consultation to now include Mission Creek lagoon. The previously developed impact avoidance and minimization measures are still included in the project, and the Measures and Terms and Conditions of the Biological Opinions will be followed.

This report focuses specifically on the potential effects of the project to steelhead and tidewater goby and their associated critical habitat. It is anticipated that the information provided herein will not cause changes to the conclusions developed in the previously issued Biological Opinions; the amount and extent of effects to essential features of critical steelhead and tidewater goby habitat are expected to be negligible and are not expected to result in adverse effects to either species. Temporary effects to these fish and essential features of their habitat are expected to be confined to the dewatered portion of the creek. Several proposed creek enhancement measures are expected to enhance wildlife and riparian habitat, as described in the LMCFCP and the specific work plans for the three bridges at the Site.

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List of Abbreviated Terms

BA	Biological Assessment
BMP	Best Management Practice(s)
BO	Biological Opinion
Caltrans	California Department of Transportation
CDFG	California Department of Fish and Game
Cfs	cubic feet per second
CI8SS	Cast-in-Steel Shell
cm	centimeter(s)
CNPS	California Native Plant Society
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
ESA	Environmentally Sensitive Area
ESU	Evolutionarily Significant Unit
FESA	Federal Endangered Species Act
ha	hectare(s)
km	kilometer(s)
LMCFCP	Lower Mission Creek Flood Control Project
m	meter(s)
ppt	parts per trillion
NMFS	National Marine Fisheries Service
PCE	primary constituent element(s)
SWPPP	Storm Water Pollution Prevention Plan
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service

1. Introduction

This updated biological assessment (BA) provides technical information regarding three bridge replacement sites along Mission Creek in Santa Barbara, California, as well as updates to previous studies, where relevant. The Federal Highway Administration (FHWA) is funding the bridge replacements and, working with Caltrans, is the lead federal action agency for the project conducting Endangered Species Act consultation with the USFWS and NMFS. This BA also includes a current review of the proposed project in sufficient detail to determine to what extent the proposed project may affect threatened, endangered, or candidate species in the project area. The information herein supplements the extensive biological information presented in the Lower Mission Creek Flood Control Plan (LMCFCP) Biological Assessments (USACE 2000b; USACE 2000c) provided by the U.S. Army Corps of Engineers (USACE) to the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) and other environmental review documents (e.g., CEQA). It should be noted however that UACE is no longer the federal action agency for the project. This supplement includes results of biological surveys conducted at each bridge site by ARCADIS in July 2010. This biological assessment was prepared in accordance with legal requirements found in Section 7(a)(2) of the Endangered Species Act (16 U.S. C 1536(c)) and with FHWA and Caltrans regulation, policy, and guidance.

1.1 Project History

The City of Santa Barbara plans to replace the Mission Creek Bridges at Mason Street (Bridge No. 51C – 287), Chapala Street (Bridge No. 51C – 0250 / BRLSZD – 5007) (043), and Cota Street (Bridge No. 51C – 0246 / BRLO) (Figures 1-9). The existing bridges are classified as structurally deficient and they lack adequate hydraulic capacity. The Lower Mission Creek Flood Control Project (LMCFCP) has been proposed to increase the flood-carrying capacity in Mission Creek from 1,050 cubic feet per second (cfs), or 29.4 cubic meters per second, to 3,400 cfs 95.2 cubic meters per second along a mile (1.6 km) of Mission Creek located between the mouth of the creek at the Cabrillo Boulevard Bridge upstream to the Canon Perdido Street Bridge (USACE 2000a). As part of this project, the creek channel will be widened and designated bridges will be replaced in order to accommodate increased channel capacity. In addition, native riparian vegetation will be planted along creek banks and in habitat expansion zones, and suitable habitat for the federally endangered steelhead (*Oncorhynchus mykiss*) and tidewater goby (*Eucyclogobius newberryi*) will be created, especially pools and shaded areas.

Figures showing additional project details are located at the back of this report. In addition to a site location map (Figure 1), additional details on the Chapala Street Bridge are shown in Figures 2-4, the Cota Street Bridge in Figures 5-6, and the Mason Street Bridge in Figures 7-9.

The existing Mason and Cota Street bridges are too narrow to accommodate increased channel capacity of the Lower Mission Creek Flood Control Project (LMCFCP), are structurally deficient in meeting current bridge construction codes, and cannot be reasonably retrofitted (the Mason Street Bridge is also deficient in meeting other associated codes including shoulder/lane width, bridge rail height and strength, roadway geometry, curb type, and sidewalk width). The Chapala Street Bridge is seismically deficient and is located along a portion of Mission Creek that bends sharply where it passes under Highway 101, a feature known locally as the oxbow. The channel will not be widened at this location because the LMCFCP would include an oxbow bypass, which will be added to supply the needed increase in hydraulic capacity to this portion of lower Mission Creek.

Construction of the three bridges will require diversion and dewatering at all three bridge locations (see Figures). The Mason Street Bridge Replacement work will require diversion and dewatering in half the width of Mission Creek within the work area throughout the bridge replacement construction period (approximately 6 months). The demolition of at least one commercial building will also be necessary. Replacement of the Cota Street Bridge will require a stream diversion to control surface water, and dewatering of ground water for the foundation construction. The demolition of at least three buildings will also be necessary. The Chapala Street Bridge replacement will require stream diversion and potential dewatering during construction. Each project is described in detail in the Sections that follow.

Mission Creek is located within the boundaries of the Southern California Distinct Population Segment for the federally endangered steelhead trout and was originally designated by the National Marine Fisheries Service (NMFS) as steelhead critical habitat on February 16, 2000, a designation that is still in effect. The tidewater goby, a federally listed endangered species, also inhabits lower Mission Creek in the City of Santa Barbara. Mission Creek was designated as critical habitat by the United States Fish and Wildlife Service (USFWS) for this species on March 3, 2008.

The NMFS, in a Biological Opinion - August 2, 2000 (Federal File # F-LB-00-23:KAJ), determined that the larger flood control project was not likely to jeopardize the continued existence of the Southern California steelhead and was not likely to destroy or adversely modify designated critical habitat. Similarly, the USFWS concluded in their Biological Opinion – June 1, 2002 (Federal File # 1-8-00-F-74) that the lower Mission Creek Flood Control Project was not likely to jeopardize the continued existence of the tidewater goby.

Minimization measures for this project include appropriate construction schedule timing and biological monitoring during construction to avoid affects to steelhead and tidewater goby; placement of diversion/dewatering systems prior to work activities; minimization of instream disturbance; and a storm water pollution prevention plan (SWPPP) that details best management practices for the project.

1.2 Project Description

Replacement of the Mason Street Bridge (Bridge No. 51C – 287), and Cota Street Bridge (Bridge No. 51C – 0246 / BRLO) was evaluated as a component of the 2000 US Army Corps of Engineers Lower Mission Creek Flood Control Feasibility Study; the existing bridges are classified as Functionally Deficient and lacking in adequate hydraulic capacity. The Chapala Street Bridge (Bridge No. 51C – 0250 / BRLSZD – 5007) (043), on Mission Creek is also planned for replacement to meet seismic safety requirements but is not part of the LMCFCP. The Santa Barbara County Flood Control District, City of Santa Barbara, and the U.S. Army Corps of Engineers are planning to construct the LMCFCP at about the same time as the Chapala Street Bridge replacement project. For all three bridge replacement projects, a qualified biologist with detailed knowledge of the federally endangered steelhead and tidewater goby will monitor project construction during critical periods, such as creek de-watering or diversion, including installation of infrastructure in the creek. Monitoring will be performed every week at the beginning of construction in the creek and every other week after commencement of the project construction, as long as construction is occurring within the creek bed. This requirement will facilitate minimization of adverse effects to steelhead and tidewater gobies during construction and restoration/maintenance. In addition, the project design avoids constriction to the width of the creek bed, and hence increases in water velocity compared with existing conditions. One of the LMCFCP goals is to create flow conditions conducive to the passage of steelhead through the length of the project in Mission Creek.

Replacement of the bridges will require stream diversion in some areas to control surface water and a groundwater dewatering system to control sub-surface water during construction. When work in a flowing stream is unavoidable, the entire stream flow will be diverted around the work area by a barrier, temporary culvert, new channel, or other approved means. A connection between downstream and upstream reaches will be provided during all times. Diverted flows will maintain standards of sufficient water quality and quantity, and of appropriate temperature to support fish and other aquatic life around the diversion; flows will meet or exceed baseline conditions. Baseline conditions will be established prior to construction and monitored upstream of any work area. Normal flows will be restored to the affected stream immediately upon completion of work at that location.

Construction of the barrier and/or the new channel will begin downstream and continue upstream, and the flow will be diverted only when construction of the diversion infrastructure is completed. Channel bank or barrier construction is deemed adequate to minimize seepage into or from the work area. Diversion berms will be constructed of low silt content, inflatable dams, silt free sand bags, sheet piles, or other approved materials. Channel banks or barriers will not be made of earth or other substances subject to erosion unless first enclosed by sheet piling, rock rip-rap, or other protective material. The enclosure and the supportive material will be removed immediately upon completion of work.

Best Management Practices (BMPs) will be utilized to further ensure reduced impacts to the stream. Water remaining in the work area after creek diversion will be removed with a submersible pump. During construction activities that could increase turbidity, sediments will be removed by filters or by allowing the sediments to settle before discharge into the creek downstream of the work area; Baker Tanks or hay bale/sandbag basins lined with filter fabric may be used to prevent degradation of receiving waters. During concrete pouring activities (for bridge supports occurring outside the flow channel), groundwater may come into contact with fresh concrete. In such situations, contaminated water will be pumped out of the work area and either be hauled away in trucks or pumped into a city sewer main (after the pH has been tested and adjusted to pre-project levels). No water that is contaminated with fresh concrete will be returned to the creek. The bridge cast-in-steel shell (CISS) piles, or other pile systems, will, due to the method of construction, prevent concrete contact with the water. The bridge deck will be constructed in a way that avoids discharging grout and other construction materials to the live stream channel work area. The abutments will be isolated from the live stream channel by dewatering. In the event of an accidental grout discharge, the contractor will be required to remove any such accidentally discharged materials from the streambed immediately.

The current construction schedule calls for the replacement of the three bridge locations in the summer of 2012 pending authorization of design, right of way, and construction funding. Current project descriptions for each of the three bridge sites are provided below, based on documents provided by the City of Santa Barbara Public Works Department (City of Santa Barbara 2010a, 2010b, 2010c); only a general overview and details that may have a direct effect on biological resources are included in this summary. Photographs of the project sites are shown in Appendix A. The full project descriptions are included as Appendix B.

1.2.1 Chapala Street Bridge Project Description

The Chapala Street site is located near a section of lower Chapala Street that dead-ends just south of railroad tracks and the Santa Barbara train station at its intersection with West Yanonali Street. It is located in an urban setting, with surrounding commercial and residential buildings nearby.

The current bridge is a simple span timber floor bridge on a 66 degree angle, with masonry stone abutments. It is approximately 80 feet (24 m) long and 58 feet (18 m) wide. This pony truss bridge was built in 1920. In this location, Mission Creek flows through a concrete-lined channel with vertical stacked sandstone walls at three corners of the bridge and a sacked concrete wall at the northeast side downstream of the bridge. The channel is approximately 28 feet (9 m) wide and 10 feet deep (3 m) at the bridge location (City of Santa Barbara Chapala Bridge Replacement Project Description, July 22, 2010) and is lined with concrete. There will be no changes to existing drainage patterns as part of this project.

The project will involve replacement of the existing bridge, which is classified as structurally deficient, with a new single span, precast slab replacement bridge that will match the current width of the existing bridge and is constructed to current codes. Due to structural and hydraulic constraints, the new bridge deck surface will be no lower than the existing bridge deck. A box culvert will be placed immediately adjacent to the north abutment of the bridge as part of the LMCFCP oxbow bypass. Because of the very close proximity of the bridge to the planned culvert, the design of the bridge will need to accommodate the culvert.

The existing stacked sandstone channel walls under the Chapala Street Bridge are of local historic interest, so if it is possible to leave them intact, the Chapala Street Bridge replacement project will avoid impacts to the channel walls. The final alignment of the flood control box culvert will be the key factor determining whether it is possible to leave the existing channel walls intact. The Santa Barbara County Flood Control District, USACE, and the City of Santa Barbara are working together to balance the hydraulic requirements of the flood control project, private property building demolition, and preservation of the channel walls.

Several alternative approaches were evaluated for this work. The selected alternative will provide more room for the flood control box culvert alignment by removing and replacing the existing north channel wall. The existing sandstone channel bridge abutment would be removed and replaced with the face of the new bridge abutment and sandstone wall. The exposed surface of the new wall would be constructed with a form liner and colored concrete similar to other bridge replacement projects on Lower Mission Creek or would be faced with sandstone to match the existing abutment. The new abutment on the south side of the channel would be constructed to avoid impacts to the southerly existing channel wall.

The existing north sandstone bridge abutment would be removed. A row of temporary piling would be installed approximately 5 feet (1.5 m) behind the sandstone walls as temporary shoring. The existing sandstone walls between the saw cuts would be completely removed, estimated to be approximately 4 feet (1.2 m) below the flow line of the concrete channel bottom. The concrete channel bottom within 10 feet (3 m) of the new wall would be removed. Groundwater would be expected below the channel bottom, so dewatering would be needed within the excavations. The groundwater would be pumped through appropriate settling tanks and filters and released into the creek downstream of the construction site. Concrete would be poured into areas that have been dewatered.

Ground disturbance in the project area would be confined to excavations in the existing paved roadway and sidewalk areas, and within the limited temporary construction easements on landscaped private properties adjacent to each corner of the bridge. The north channel wall would be removed with an excavation for the new abutment 7 feet (2 m) wide and 4 feet (1.2 m) below the channel bottom, dewatered as described above. The concrete-lined channel would support the diversion dam and pipe(s), falsework pads, and laborers within the project limits during construction.

The bridge deck demolition requirements will follow section 15-4.02 of the 2006 Caltrans Standard Specifications. Demolition of the existing bridge, utility relocation, use of construction staging areas, and roadway improvements are part of the project. The Mission Creek channel will be protected during demolition by means of the stream diversion and the use of plastic or fabric sheets to contain debris that falls through the timber stringers.

Road work will consist of repaving the bridge approaches, which will conform to the existing roadway within 75 feet (3 m) of the each end of the bridge in any direction. Hardscape and landscaping in conflict with new construction will be removed. The areas around the corners of the new bridge will be cleared of vegetation, as well as fencing and planter beds to enhance access to the construction site. The project will require the removal of two trees of greater than 6-inch trunk diameter as shown on the preliminary project plan. The park at the northeast corner of Chapala and Yanonali Street will be designated on the plans as an environmentally sensitive area (ESA) and will be fenced off to prevent the contractor from entering the park property. The existing "Potter Bridge" just upstream of the project and adjacent to the northwest corner of the Chapala Street Bridge will be designated as an ESA to be protected in-place with no disturbance from this project

For each one of the alternative bridge abutments described above, there are two options for deck replacement. The first option would be to replace the bridge deck in a similar configuration to the existing deck configuration. The second option may exclude construction of the deck for that portion of the bridge that is supported by the triangular end span on the railroad side of the bridge.

In order to implement the Chapala Street Bridge replacement, diversion of Mission Creek in the project area will be necessary. All dewatering activities will be subject to City and County specifications and CDFG, USFWS, and NMFS regulations. The stream diversion will be constructed within the existing concrete-lined channel in order to divert the flow of water around the demolition and construction activities. Pipes will be utilized to convey stream flow at anticipated flow rates, and sandbags and plastic sheeting will be used to construct a diversion dam upstream from the Site within the project limits. Groundwater will be pumped through appropriate settling tanks and filters and released into the creek downstream from the construction site. The downstream side of the diversion will drop off the concrete-lined channel into the natural channel; as a result, any water trapped downstream of the diversion dam will drain by gravity flow into the natural channel, leaving the work area dry. Subsequent to construction completion, the stream diversion infrastructure will be removed from the channel, including the temporary dam, pipe, sandbags, and plastic sheeting.

1.2.2 Cota Street Bridge Project Description

The Cota Street site is located between Bath Street and de la Vina Street at Cota Street. It is located in an urban setting, with surrounding residential buildings nearby, including numerous single-family homes as well as apartments. The current 60-foot wide bridge will be replaced with a single span 60-foot wide replacement bridge that would be constructed to current codes. The channel width would be increased to that required by the LMCFCP, approximately 55 feet (17 m).

The roadway geometry will be unchanged, as it appears that the general components of the roadway corridor meet the current code, with the exception of access ramps at the curb returns of Bath/Cota streets. The replacement bridge superstructure will be built of reinforced concrete and designed in accordance with current codes, but will match the appearance of the existing structure. No change in width or alignment is proposed. The foundation for the bridge is anticipated to be piles (cast-in-steel shell), supporting a reinforced concrete pile cap, which will in turn support the bridge abutments, which will then support the bridge deck above.

The channel adjacent to the bridge will be widened to accommodate the future LMCFCP. The bridge will "transition" to the creek walls via "transition walls." The new transition walls will mimic the original sandstone walls and will be in service until the overall LMCFCP is constructed in the immediate vicinity adjacent to the bridge.

Replacement of the bridge will require stream diversion to control surface water, and dewatering of groundwater for the foundation construction. To avoid impacts to the federally endangered steelhead, construction will be restricted to dates between June I and December 1st if water flow in Mission Creek upstream of Yanonali Street the Caltrans Channel) is more than 1/2 inch deep. If no continuous surface water flow (defined as more than 1/2 inch for April and May and more than one inch from June through November) exists in the Caltrans Channel after April 15th, construction may potentially occur between April 15th until December 1st.

The following measures are detailed in the Cota Street Bridge Project Description dated July 25, 2010 for any construction in the creek bed:

- No construction, except of a diversion, will occur in the flowing water. If water is present during the construction, the water will be diverted by construction of a low flow channel or installation of a pipe or pipes.

- A qualified biologist (knowledgeable of steelhead and tidewater goby) shall monitor project construction in critical times, (during de-watering of the creek, or installation of a diversion including pipes in the creek). Monitoring will be performed every week at the beginning of construction in the creek and every other week after commencement of the project construction as long as construction is occurring within the creek bed.

- Minimize adverse effects during construction and subsequent maintenance to steelhead and tidewater gobies.

- Implement a design that causes no constriction to the creek bed, and hence no increase of water velocity compared to existing conditions.

- Create flow conditions conducive to the passage of steelhead through the length of the project on Mission Creek.

The construction area will be dewatered to avoid sedimentation impacts downstream. Best Management Practices (BMPs) will be used to further reduce impacts to the stream. Water remaining in the work area after creek diversion will be removed with a pump. During pile-driving and construction of the two abutments, or other similar activities that will increase turbidity, sediments will be removed by means of settling or filtering of water before discharge to the creek, downstream of the work area. Methods may include using Baker Tanks or hay bale/sandbag basins lined with filter fabric. During concrete pouring activities, when the groundwater may come in contact with fresh concrete, contaminated water will be pumped out of the work area. The contaminated water will be hauled away in trucks or pumped into a city sewer main after the ph has been tested and adjusted to pre-project levels. No water that is contaminated with fresh concrete will be returned to the creek. The bridge CISS piles, or other option pile systems, will, due to the method of construction, prevent concrete contact with the water. The bridge deck will be constructed in a way that avoids discharging grout and other construction materials into the live stream channel work area. The abutments will be isolated from the live stream channel by dewatering. A temporary diversion, constructed of silt-free gravel bags and plastic sheeting, will direct water into a culvert. The culvert will discharge downstream of the work area. In the event of an accidental grout discharge, the contractor will be required to remove any such accidentally discharged materials from the streambed immediately.

1.2.3 Mason Street Bridge Project Description

The Mason Street site is located between State Street and Chapala Street and is in an area of the channel subject to tidal influence, a feature typical of estuaries. It is located in an urban setting, with surrounding commercial and residential buildings nearby. The current 32-foot (10-m) span bridge will be replaced with a single span 55-foot (17-m) long replacement bridge that will be constructed to current codes. The deck will be reinforced concrete; either cast-in-place or prefabricated pre-cast/pre-stressed components, and brought on-site. The proposed bridge cross section will include two 12-foot-wide (4-m-wide) vehicle lanes, two 7-foot–wide (2-m-wide) bike lanes/shoulders, and two 6-foot wide sidewalks, creating an overall width of approximately 48 feet (15 m). The proposed curb will be 6 to 9 inches (15 to 23 cm) high, depending on the need determined in detailed design. The bridge will be supported on a pile foundation. On top of the piles, a pile cap will support the abutments, which will support the bridge deck above.

The channel adjacent to the bridge will be widened to about 55 feet (17 m). The stream channel walls adjacent to the bridge will be supported by "transition walls" constructed for a length of 70 to 80 feet (21 to 23 m) on two of the four corners. The surface finish of the walls will be faux sandstone walls and will be in service until the overall LMCFCP is constructed, when the walls will be replaced. The third corner transition wall would be about 30-40 feet in length. The fourth corner, at 15 W. Mason Street, will be supported by walls that are shorter in length and perhaps height, in order to provide a natural bank at this location.

On the upstream side, a palm tree will be removed to make room for construction of the bridge. On the downstream side there is a triple-trunk western sycamore tree that will be pruned, the most steeply leaning trunk will be removed, and the remainder of the tree will be protected in place.

The following measures are detailed in the Mason Street Bridge Project Description for any construction in the creek bed:

No construction except installation of diversions devices and water diversions properly overseen by a fisheries biologist shall occur in the flowing water. When work in a flowing stream is unavoidable, the stream flow shall be diverted around the work area by a barrier, temporary culvert, new channel, or other approved means. Construction of the barrier and/or the new channel shall normally begin in the downstream area and continue in an upstream direction, and the flow shall be diverted only when construction of the diversion structure is complete. Channel bank or barrier construction shall be adequate to minimize seepage into or from the work area. Diversion berms shall be constructed of low silt content, inflatable dams, silt free sand bags, sheet piles, or other approved materials. Channel banks or barriers shall not be made of earth or other substances subject to erosion unless first enclosed by sheet piling, rock rip-rap, or other protective material. The enclosure and the supportive material shall be removed when the work is completed.

Flow diversions shall be done in a manner that prevents pollution and/or siltation and which shall provide flows to the lagoon. A connection between downstream and upstream reaches shall be provided during all times. Diverted flows shall be of sufficient quality and quantity, and of appropriate temperature to support fish and other aquatic life around the diversion; flows shall meet or exceed baseline conditions. Baseline conditions would be established prior to construction and monitored upstream of any work area. Normal flows shall be restored to the affected stream immediately upon completion of work at that location.

No construction work shall be allowed in water in the estuary from December 1 to June 1st. The City's anticipated method of dewatering the work area, from June 2nd, to November 31st, will involve the following specific steps, and follows the minimization measures required for construction between Cabrillo Boulevard and Yanonali Street in the LMCFCP mitigation monitoring plan (USACE 2000d):

1. A qualified biologist familiar with aquatic species native to Mission Creek shall be present during the diversion operations.

2. Two rows of sheet piling or equivalent shall be placed in the approximate middle of the stream about 1 foot apart and vibrated or driven to adequate depth into the lagoon floor by equipment on the creek bank. Alternatively, the double row of sheet piles would be inserted parallel and closer to the bridge abutments on both sides of the creek so as not to temporarily restrict the creek width to less than 10 feet.

3. A barrier (sheet piles, sand bags, or equivalent) shall be placed on the upstream side between the end of the row of sheet piles and the creek bank to block one end of the diversion.

4. A qualified biologist shall walk downstream in a zigzag pattern to herd as many fish as possible from the incipient enclosure

5. Fish biologists shall seine the entire contained half thoroughly to remove any gobies and other large organisms to the wet side of the construction enclosure.

6. After the fish relocation has been complete the downstream end blocking nets shall be installed to cordon off the area and the area shall be blocked off to water in a manner similar to the upstream side.

7. The portion of the lagoon that has been enclosed shall be seined by the biologist to capture any remaining fish and any remaining fish shall be relocated outside the enclosed area in the lagoon.

8. Pumps with adequate sized screening shall be used to dewater the area. Water shall be pumped into a bladder(s), for discharge into the lagoon, when water quality warrants or to a tank for storage and off hauling if water quality is below that of receiving waters.

9. Fish biologists shall monitor the drying enclosure and seine it thoroughly at least twice a week.

10. When construction on one side has been completed, the downstream wall of the enclosure shall be removed first, followed by the upstream end.

11. The above steps shall be repeated for the opposite bank construction.

1.3 Summary of Consultation to Date

Previous consultation relevant for replacing the Cota and Mason Street Bridges has occurred in relation to the larger Lower Mission Creek Flood Control Project. The NMFS, in a Biological Opinion - August 2, 2000 (Federal File # F-LB-00-23:KAJ), determined that the larger flood control project was not likely to jeopardize the continued existence of the Southern California steelhead and was not likely to destroy or adversely modify designated critical habitat. Similarly, the USFWS concluded in their Biological Opinion – June 1, 2002 (Federal File # 1-8-00-F-74) that the lower Mission Creek Flood Control Project was not likely to jeopardize the continued existence of the tidewater goby. The Biological Assessments for steelhead and tidewater goby and the corresponding Biological Opinions are included as Appendix C and D, respectively.

The Chapala Street Bridge replacement project, while not part of the LMCFCP, is also located on Mission Creek, a short distance upstream from the Mason Street Bridge and a short distance downstream from the Cota Street Bridge. In addition, the proposed Chapala Bridge replacement project involves less construction than the other two bridges construction (because creek widening is not involved) and would include applicable precautions from environmental consultation to date, as described above.

1.4 Document Preparation History

This Biological Assessment report has been prepared by the following entities:

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2. Study Methods

Literature Search: Prior to performing the fieldwork, ARCADIS conducted a review of documents concerning Lower Mission Creek and the surrounding areas, including a search of the California Natural Diversity Database (CNDDB; California Department of Fish and Game [CDFG] 2010) for the U.S. Geological Survey (USGS) 7.5-minute series Santa Barbara, Carpinteria, Goleta, Dos Pueblos Canyon, San Marcos Pass, Little Pine Mountain, and Hildreth Peak topographic quadrangles. The California Native Plant Society's (CNPS) Electronic Inventory of Rare and Endangered Vascular (CNPS 2010) was also queried for appropriate habitat within the Santa Barbara Quadrangle and adjacent quadrangles. Other resources utilized for this assessment included previous biological assessments, reports, and Biological Opinions prepared for the LMCFCP, updated project descriptions for the Cota Street, Chapala Street and Mason Street replacement bridges, various county, state, and federal regulations, review of other recent ecological reports completed in and around the Site, and ARCADIS' direct experience in the region.

Sensitive wildlife investigations for the Site were based upon the substantial volume of data collected and assessed in previous reports as well as wildlife species reported in the CNDDB. The database was queried for a baseline list of sensitive wildlife species reported from locations in the extended Site vicinity. From there, specific species habitat requirements were compared with conditions existing at the Site to determine which species could potentially occur on the Site and which species might be eliminated from further examination. Additional detailed biological information (typically habitat preference) was obtained from internet searches targeting specific species of interest. Species location coordinates provided in the selected CNDDB list of sensitive species for the Site were utilized to assess their proximity to the Site and identify any habitat similarities that might be revealed through aerial imagery. ARCADIS' familiarity with habitat requirements for species included in the CNDDB inventory and with the existing habitat conditions on and around the Site also aided in compilation of data, in conjunction with review of other ecological documents from nearby locations.

Field Surveys: Biological surveys of the three bridge sites were conducted on June 16, July 8, and July 15, 2010 by ARCADIS Senior Ecologist Mary Carroll and Project Biologist Nicholas Kautzman in order to verify and update project information. The ARCADIS surveys focused primarily on proposed construction areas as indicated in bridge replacement plans provided by the City of Santa Barbara (Figures 1-9).

Botanical Surveys: ARCADIS plant surveys encompass gathering of information on species composition, abundance, relative distribution, and community composition (including dominants, associates, and uncommon elements), covering all areas in the project area on foot at least twice. Physiographic features are noted and correlated with plant distributions, with special attention paid to accessible drainages and wetlands, rocky/exposed outcrops and changes in soil type, and native communities in the project area. Surveys were conducted during flowering seasons for special-status species known from the area, were designed to systematically cover all habitat types on Site, and were consistent with conservation ethics.

All plant species found to be in a recognizable condition during the ARCADIS surveys were recorded and are listed in Table 1. Nomenclature follows the Jepson Online Interchange (Baldwin et al. 2010), which lists updates based on *The Jepson Manual* (Hickman 1993). In addition, pertinent volumes of the *Flora of North America* were also utilized for plant identification (Flora of North America Editorial Committee, eds. 1993+). Plant surveys were completed during the appropriate season for most species to be recognizable. As with any site, it is important to note that the list of vascular plant species on the Site presented in this report may not be comprehensive and additional species may be found during future visits.

<u>Sensitive Species Surveys</u>: As mentioned, prior to the initial Site visit, a review of all sensitive species reported in the Santa Barbara and adjacent quadrangles was conducted utilizing CNDDB (2010) and CNPS (2010). Potentially occurring sensitive ecological resources identified during the database and background search are listed in Table 2.

Among the data reviewed were known locations, habitats, soil or other environmental preferences, elevational range, and other pertinent information. This information was then used during field surveys in order to conduct focused searches for sensitive species. In the event that one or more sensitive species might be found, location data, including GPS coordinates, elevation, slope exposure, soil type, habitat type, associated species, population size, phenology, and other relevant data would be recorded for each location and species. In addition, a field survey form would be submitted to CNDDB documenting the data on the sensitive species on Site.

<u>Wildlife Surveys</u>: All wildlife species observed at the Site or assumed present from sign (tracks, burrows, scat, nests) during the surveys are discussed in Section 4. ARCADIS wildlife surveys are intended to identify all wildlife utilizing a Site or as many species as can be inferred from direct observation or from various sign (prints, sounds, burrows, trails, nests, prey remains, foraging and other impacts to vegetation, etc.). Active searches for birds and mammals included direct observation, auditory recognition, and diagnostic sign (prints, sounds, burrows, trails, nests, prey remains, foraging and other impacts to vegetation, etc.). For reptiles and amphibians, the search was also expanded to include lifting/turning and carefully replacing rocks and debris.

Wildlife surveys emphasize the characterization of existing habitat in terms of suitability and value for both known and potentially occurring sensitive wildlife species and seek to determine the extent to which wildlife species utilize existing habitat for different life cycle and behavioral needs (e.g., breeding, foraging, dispersal, cover). Although all wildlife species observed or indicated in the field during surveys are recorded, a primary focus of the wildlife surveys is to determine the presence or potential for the presence of sensitive and rare species. The list of wildlife species presented in this report may not be comprehensive. In order to create a more comprehensive wildlife census, multiple surveys over several years would be required to enable observation of species during the day and at night, during different seasons, and during different weather conditions when some species are more likely to be detected.

Creek Width and Water Quality Sampling: A standard tape measure was used to measure stream width at each bridge site. Measurements of water salinity and temperature were obtained at each bridge site by utilizing a YSI 30-10 Dual Parameter Conductivity Meter; this handheld instrument includes a 25-foot (8 m) cable that allows for water sampling to measure salinity, conductivity, and temperature at different water depths.

3. Environmental Setting

The project area is located along the south coast of Santa Barbara County, with the Pacific Ocean to the south and the Santa Ynez Mountains to the north, a unique geographic alignment found in few places in North America. The Santa Ynez Mountains extend from Point Conception into western Ventura County; high peaks include La Cumbre Peak at 3,995 feet (1,218 m) above Mission Canyon and Divide Peak at 4,787 feet (1,460 m) elevation close to the Santa Barbara-Ventura County line. Most canyons on the south side of these mountains drain southward to the Pacific Ocean, including Mission Creek.

Mission Creek is a 7.5 mile-long (12 km-long) perennial stream that drains an approximately 7,786-acre (3,151-ha) watershed on the south slope of the Santa Ynez Mountains. Its headwaters originate below the crest of the Santa Ynez Mountains, flanked by La Cumbre Peak (3,985 feet, or 1,218 m, above msl) to the west and an eastern ridge reaching over 3,440 feet (1,049 m) above msl. Mission Creek and its major tributary, Rattlesnake Creek, descend from the steep slopes above to merge near the Santa Barbara Mission. Gradients above this location are approximately 1,000 feet per mile, or 305 m per 1.6 km (NMFS 2000), and the creek corridor is lined with a dense canopy of riparian woodland and forest. Creek banks in this area have natural sides and support native vegetation, unless modified by private landowners. Trout have been observed in this area of the creek on numerous occasions (NMWS 2000). Along the main branch of Mission Creek there are two manmade barriers, the old Mission Dam in the Santa Barbara Botanic Garden, built in 1806, as well as a debris basin and dam upstream. Rattlesnake Creek also has a less noticeable dam built in 1806 along with a debris dam.

Below the Mission, the creek banks and trajectory have been modified for flood control, highway construction, and residential and industrial purposes; a small portion of the former riparian corridor of Mission Creek has been recently restored west of Highway 101 at Bohnett

Park, overseen by the City of Santa Barbara. Portions of lower Mission Creek contain concrete-lined channels and banks, as well as a variety of other bank stabilization infrastructure, including stacked burlap bags filled with concrete, cemented rocks, masonry walls, shot-crete walls, gabions, and other revetments. The native vegetation has largely been modified, with a few remaining native riparian trees, especially large sycamores (*Platanus racemosa*), a few scattered coast live oak trees (*Quercus agrifolia*) and arroyo willows (*Salix lasiolepis*). Cottonwood (*Populus*) and white alder (*Alnus rhombifolia*) have also been reported in lower Mission Creek (USACE 2000a). However, once Mission Creek reaches the eastern edge of Highway 101 below Oak Park near Junipero Street, there is no contiguous native riparian canopy and no layer of native shrubs and herbs on the stream banks. Residential and commercial structures encroach directly into the floodplain. Periodic removal of vegetation in the channel is part of routine flood control maintenance (USACE 2000a). Refuse and pollution also introduce contaminants into the creek corridor.

A small lagoon is present at the creek mouth, just east of Stearns Wharf, extending almost up to Yanonali Street. Creek walls in this area are stabilized with concrete or gabions.

Opportunistic non-native species predominate along lower Mission Creek, displacing native species and reducing habitat quality and functions. The most problematic invasive species include giant reed (*Arundo donax*), castor bean (*Ricinus communis*), pampas grass (*Cortaderia jubata*), periwinkle (*Vinca major*), English ivy (*Hedera helix*), tree tobacco (*Nicotiana glauca*), shamel ash (*Fraxinus uhdei*), and tree of heaven (*Ailanthus altissima*).

Due primarily to the surrounding urban environment, limited natural open space and close proximity to human disturbance, few wildlife species were observed during the surveys by ARCADIS. Wildlife species observed during the surveys included the following: raccoon (*Procyon lotor*), pacific treefrog (*Hyla regila*), American crow (*Corvus brachyrhynchos)*, barn swallow (*Hirundo rustica*), black-crowned night heron (*Nycticorax nycticorax*), black phoebe (*Sayornis nigris*), hooded oriole (*Icterus cucullatus*), house sparrow (*Passer domesticus*), northern mockingbird (*Mimus polyglottos*), rock dove (*Columba livia*), and scrub jay (*Aphelocoma californica*).

A total of six habitat types were identified at the three bridge sites during the ARCADIS 2010 survey; not all communities were observed at all sites. These include two upland communities: non-native grassland/ruderal and ornamental plantings and four wetland habitat types: southern mixed riparian forest, coastal and valley freshwater marsh, coastal brackish marsh (estuary), and coastal steelhead trout stream; the wetland habitats are natural communities of special concern (Table 2).

No additional sensitive species relevant to the project have been federally listed since the previously prepared Biological Assessments (USACE 2000b, USACE 2000c), or since the last agency consultation. The two sensitive wildlife species that were the focus of the last consultation, the steelhead and tidewater goby, remain the only sensitive species known from the project area as a result of studies during preparation of this addendum biological assessment. Biological information from references subsequent to the last agency consultation is provided below.

Photographs provided in Appendix A offer views of the habitats observed on the Site.

4. Results

The Site supports a mosaic of native, weedy, and planted vegetation that will be summarized in the ensuing sections. Six habitat types were identified on the Site during the ARCADIS surveys. These include two upland communities: non-native grassland/ruderal and ornamental plantings and four wetland habitat types: and four wetland habitat types: southern mixed riparian forest, coastal and valley freshwater marsh, coastal brackish marsh (estuary), and coastal steelhead trout stream; the wetland habitats are natural communities of special concern

4.1 Current Biological Conditions at Each Bridge Site

Biological surveys of the three bridge sites were conducted on June 16, July 8, and July 15, 2010 by ARCADIS Senior Ecologist Mary Carroll and Project Biologist Nicholas Kautzman in order to verify and update project information. An inventory of all observed plant and wildlife species was made, along with measurements of water salinity and stream width.

4.1.1 Chapala Street Bridge Current Biological Conditions

During the ARCADIS 2010 July visit to the Chapala Street Bridge site, the width of the constructed channel was measured at approximately 33 feet (10 m). Mission Creek spans the entire width of the channel about 20 feet (6 m) downstream from the Chapala Street Bridge; however, in the vicinity of the bridge, the stream tapers to a broad shallow glide that meanders through the sand, occupying about half the channel. This portion of Mission Creek stream is entirely bound within a constructed channel comprised of cast concrete, piled concrete, or stone masonry. The concrete channel bottom is often covered with sand on top of the concrete, as it was during the site visit, and a sand bar is visible just downstream of the bridge and fills the majority of the constructed channel upstream. Water salinity under the bridge was 0.6 g/L@ 18.8 ° Celsius at the time of the survey, and water depth was approximately 4 inches (10 cm).

The Chapala Street Bridge site is highly disturbed, with a predominance of non-native vegetation. One large native western sycamore (*Platanus racemosa*) occurs in front of a building on Chapala Street just east (downstream) of the bridge, and the vertical constructed walls in this area are covered with non-native English ivy (*Hedera helix*). The vegetation in the channel bottom upstream of the Chapala Street Bridge includes a limited amount of scattered native herbaceous perennial species typical of freshwater marsh, especially along the channel margins; these include common horsetail (*Equisetum arvense*), iris-leaved rush (*Juncus xiphioides*), cattail (*Typha latifolia*), water cress (*Nasturtium officinale*), and scattered willow (*Salix*) seedlings. Downstream from the bridge, the riparian vegetation is limited to the northeast side of the creek, and is comprised of mostly non-native species such as edible fig (*Ficus carica*), giant yucca (*Yucca elephantipes*), and giant reed (*Arundo donax*), although two young western sycamores are present as well.

In the CNDDB community classification system (Holland 1986), marsh vegetation onsite is part of the Coastal and Valley Freshwater Marsh Community. In the CNPS *Manual of California Vegetation* (Sawyer, Keeler-Wolf, and Evans 2009), the freshwater marsh vegetation along most riparian corridors fits best into the *Typha latifolia* Herbaceous Alliance.

During the July 8, 2010 site visit aquatic vegetation was almost entirely absent from the stream corridor. On a subsequent site visit on July 15, 2010, a large amount a filamentous algae was present near the bridge and extended downstream for approximately 100 feet (30 m). Water depth was also greater downstream by approximately 6 to 8 inches (15 to 20 cm).

Wildlife species observed include northern mockingbird (*Mimus polyglottos*), hooded oriole (*Icterus cucullatus*), American crow (*Corvus brachyrhynchos*), black phoebe (*Sayornis nigricans)*, mallard (*Anas platyrhynchos*), rock dove (*Columba livea*), and house sparrow (*Passer domesticus*).

Mission Creek in the Chapala Street Bridge area is currently not suitable steelhead habitat, although steelhead habitat is present in the estuarine portion of the creek downstream from the bridge. The estuarine area nearby would be used by fry (young of the year) as they go through the process of smoltification (transition into the marine form of steelhead); the smolts would then forage in the estuary before being released to the ocean when the estuary is breached during winter storms. Tidewater goby habitat is also present downstream of the project site in the estuarine portion of the creek.

No sensitive species were observed in this area during the ARCADIS 2010 survey; a limited amount of freshwater marsh vegetation is present, along with three isolated western sycamore individuals. The Chapala Street Bridge replacement project, while not part of the LMCFCP, is also located on Mission Creek, a short distance upstream from the Mason Street Bridge and a short distance downstream from the Cota Street Bridge. In addition, the proposed Chapala Bridge replacement project involves less construction than the other two bridges construction (because creek widening is not involved) and would include applicable precautions from environmental consultation to date.

4.1.2 Cota Street Bridge Current Biological Conditions

During the ARCADIS 2010 July visit to the Cota Street Bridge site, the width of Mission Creek from bank to bank was measured at 16 feet 2 inches (5 m), with a bank-full depth of approximately 14 inches (36 cm). The average depth at the time of the survey was approximately 1.5 inches (4 cm). The width of the riparian corridor ranges widely in this area. A large pool (approximately 50 feet [15 m] by 20 feet [6 m]) is present upstream from the project area just to the north of the Bath Street Bridge; this pool extends underneath the Bath Street Bridge, where the creek then transitions into a small section of riffle until it reaches approximately 40 feet (12 m) from the Cota Street Bridge, where it turns into a glide and continues as such through the rest of the project area. This pool provides limited cover, confined to areas in and beneath the gabions at the head of the pool. The substrate north of the Cota Street Bridge in the riffle area is comprised mainly cobble embedded in sand; the substrate in the pool and glide areas is almost entirely sand, although some cobbles are interspersed throughout the creekbed. Rack (debris) in some of the riparian vegetation provides evidence of storm flows of over 6 feet (3 m) in depth during flooded conditions.

The stream banks vary in steepness and are densely vegetated to the north of the Cota Street Bridge; there are some concrete surfaces adjacent to the bridge, and downstream, the southeastern bank consists of a wall of piled concrete bags.

The Cota Street site supports a small fragment of mixed riparian forest dominated by western sycamore and arroyo willow (*Salix lasiolepis*), which form a dense canopy on the upstream side of the existing bridge; in this area, the banks of the creeks are natural and consist of rocks and soil. In the understory of the canopy along the stream in this area, native herbaceous perennial species typical of freshwater marsh are present, including large patches of yellow water-primrose (*Ludwigia peploides*) and common horsetail, as well as spotted water smartweed (*Persicaria punctata*), whorled marsh pennywort (*Hydrocotyle verticillata*), and duckweed (*Lemna* species).

The riparian vegetation is more disturbed on the downstream side of the existing bridge, and the banks on the southwest side of the creek in this area are covered with sacked concrete. Native marsh vegetation comprised of cattail clumps are present, along with common horsetail, yellow water-primrose, spotted water smartweed, tall nutsedge (*Cyperus eragostis*), and other native species, mixed with many non-natives, especially giant reed (*Arundo donax*) and English ivy (*Hedera helix*).

Near the northeast corner of Bath and Cota Streets, a disturbed access corridor upslope from the creek supports weedy grasses and other non-native species characteristic of non-native grassland and ruderal habitats.

In the CNDDB community classification system (Holland 1986), the southern mixed riparian forest is part of the Southern Mixed Riparian Forest Community. This vegetation best fits into the *Platanus racemosa* Woodland Alliance or the *Salix lasiolepis* Woodland Alliance listed in the CNPS *Manual of California Vegetation* (Sawyer, Keeler-Wolf, and Evans 2009). In the CNDDB community classification system (Holland 1986), freshwater marsh vegetation onsite is part of the Coastal and Valley Freshwater Marsh Community. In the CNPS *Manual of California Vegetation* (Sawyer, Keeler-Wolf, and Evans 2009), the freshwater marsh vegetation along most riparian corridors fits best into the *Typha latifolia* Herbaceous Alliance.

Wildlife and signs observed in the project area include tadpoles of Pacific tree frog (*Hyla regilla*), raccoon tracks (*Procyon lotor*), American crow (*Corvus brachyrhynchos*), barn swallow (*Hirundo rustica*, with a single nest under the Cota Street Bridge), rock dove (*Columba livia*), and house sparrow (*Passer domesticus*).

Steelhead habitat in the vicinity of the Cota Street Bridge is currently marginal. The large pool to the north of the project area could potentially be used by juvenile fish; no other location in and adjacent to the project area provides sufficient shade, summer cover, and water depth for steelhead. Breeding habitat is also very marginal at present; it is possible that, following large storm events, there may be sufficient scour to remove some of the fine sand and leave the coarse sands and gravels normally used by steelhead for spawning. There are no characteristics of the substrate that would indicate that steelhead breeding habitat is currently present at the Cota Street location. There is no tidewater goby habitat in the project area.

No sensitive species were observed in this area during the ARCADIS 2010 survey. Fragments of southern mixed riparian forest and freshwater marsh vegetation are present, along with marginal steelhead habitat; these are treated as sensitive by CNDDB (2010) and the County of Santa Barbara (2007). Current conditions do not appear to have changed from those described in the LMCFCP BA (USACE 2000b; USACE 2000c), other than the inclusion of Mission Creek as tidewater goby critical habitat.

4.1.3 Mason Street Bridge Current Biological Conditions

During the ARCADIS 2010 July visit to the Mason Street Bridge site, the span of the creek was measured at approximately 38 feet (12 m), with an average depth of 22 inches (56 cm). The walls of the channel in this location are constructed from a range of materials: concrete bags, wood, poured concrete (including a building foundation), piled stone, and gabions. The substrate in this portion of the creek is mainly sand, with occasional boulders or other substrate (broken pipe, etc.); a small sandbar is present upstream of the project area. Salinity was measured at 7.4 g/L@ 24.5° Celsius at the water surface, and 1.5 g/L @19.0° Celsius at the stream bottom. The mid-column water temperature was 23.2 ° Celsius.

The vegetation adjacent to the Mason Street Bridge site is highly disturbed, with a predominance of non-native species. One large native riparian tree, western sycamore, occurs on the edge of the stream bank on the southeast (downstream) side of the bridge. Other vegetation in the immediate vicinity of the proposed Mason Street Bridge encompasses a combination of planted and ruderal/invasive species.

Few wildlife species were present during the ARCADIS 2010 July survey. These include scrub jay (*Aphelocoma californica*), rock dove (*Columba livia*), and black-crowned night heron (*Nycticorax nycticorax*).

Very little aquatic vegetation is present in this portion of the Mission Creek. Habitat for steelhead smolts and tidewater goby is present in the estuarine environment around the Mason Street Bridge, and there is documented goby breeding habitat farther down Mission Creek at the State Street Bridge (CDFG 2010). Steelhead smolts may potentially be present throughout the estuary, changing locations based on the fluctuating salinity levels, food availability, point in the smoltification process, and hiding cover. There were no changes in substrate that would indicate that breeding habitat is currently present at the Mason street location.

No sensitive vegetation types or species were observed in this area during the ARCADIS 2010 survey. Current conditions do not appear to have changed from those described in the LMCFCP BA (USACE 2000b; USACE 2000c), other than the inclusion of Mission Creek Estuary as tidewater goby critical habitat.

4.2 Federally Endangered Species in Project Area

Two federally endangered species have been reported from the project area, steelhead and tidewater goby.

4.2.1 Steelhead

The following summary of Lower Mission Creek and presence of steelhead is excerpted from the Biological Assessment prepared for the Ortega and Haley/de la Vina Street bridges (Caltrans 2007):

> *Mission Creek is one of 27 potential trout-bearing streams that comprise the Conception Coast biogeographic population group of the Southern California steelhead ESU. It is typical of the steelhead streams south of the Santa Ynez River that drain from the Santa Ynez Mountains south to the Pacific Ocean. Most of these streams are relatively short with steep upper watersheds.*
>
> *The lower reaches of Mission Creek have been heavily affected by urban development. The area that will be affected by the proposed action shows much*

evidence of historic channelization: the ecological consequences of channelization include loss, reduction, or alteration of habitat complexity, streamside or bank cover, and pool habitat; and, elimination of spawning, rearing, and feeding areas for fish.

Steelhead have occasionally been documented using the creek and in 2000 a pair were seen spawning near the Ortega Street Bridge located upstream of the three bridge locations described herein. *The lower reaches of the creek would probably not normally be utilized for spawning because of the lined concrete sections of channel upstream of the project site. Under most flow conditions, migration upstream to their natural spawning grounds is probably impeded if not prevented. The lined portion of the channel is not a complete barrier to migration as there is some documented evidence of spawning upstream from this section of creek.*

The Cabrillo Street Bridge, which is one block downstream of the Mason Street Bridge, may provide a migration corridor for steelhead when the sand bar at the mouth of the creek is open, and may also support some rearing habitat. No spawning occurs in this area. The number of steelhead that uses Mission Creek is unknown (SAIC 2009).

Mission Creek is included in the critical habitat designation for steelhead.

4.2.1.1 Steelhead Survey Results

Southern steelhead are known to occur in Mission Creek as indicated by the documented sightings described on page 3 of the Revised Biological Assessment (USACE 2000b). Steelhead surveys in Mission Creek were not conducted for this biological assessment. However, Mission Creek continues to possess all of the primary constituent elements (PCEs) of critical habitat for steelhead and steelhead are inferred to be present in the creek at this time.

4.2.1.2 Steelhead Critical Habitat

Mission Creek was designated as critical habitat by the United States Fish and Wildlife Service (USFWS) for this species on March 3, 2008. The USFWS, describes critical habitat for steelhead as possessing the following PCEs, as published in the Federal Register dated 9-02-2005 (Vol. 70), pages 52487 – 52627,

1. *Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development. These features are essential to conservation because without them the species cannot successfully spawn and produce offspring.*

2. *Freshwater rearing sites with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility;*

water quality and forage supporting juvenile development; and natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks. These features are essential to conservation because without them juveniles cannot access and use the areas needed to forage, grow, and develop behaviors (e.g., predator avoidance, competition) that help ensure their survival.

3. *Freshwater migration corridors free of obstruction with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival. These features are essential to conservation because without them juveniles cannot use the variety of habitats that allow them to avoid high flows, avoid predators, successfully compete, begin the behavioral and physiological changes needed for life in the ocean, and reach the ocean in a timely manner. Similarly, these features are essential for adults because they allow fish in a non-feeding condition to successfully swim upstream, avoid predators, and reach spawning areas on limited energy stores.*

4. *Estuarine areas free of obstruction with water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh- and saltwater; natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels; and juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation. These features are essential to conservation because without them juveniles cannot reach the ocean in a timely manner and use the variety of habitats that allow them to avoid predators, compete successfully, and complete the behavioral and physiological changes needed for life in the ocean. Similarly, these features are essential to the conservation of adults because they provide a final source of abundant forage that will provide the energy stores needed to make the physiological transition to fresh water, migrate upstream, avoid predators, and develop to maturity upon reaching spawning areas.*

5. *Nearshore marine areas free of obstruction with water quality and quantity conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation; and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels. As in the case with freshwater migration corridors and estuarine areas, nearshore marine features are essential to conservation because without them juveniles cannot successfully transition from natal streams to offshore marine areas.*

6. *Offshore marine areas with water quality conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation."*

As published in the Federal Register on September 2, 2005 (70FR52488 – 52627), critical habitat for the southern California steelhead ESU includes the Mission Hydrologic Sub-area containing Mission Creek.

4.2.1.3 Steelhead Avoidance and Minimization Efforts

ARCADIS concurs that all of the original avoidance and minimization measures described in the Lower Mission Creek Flood Control EIS/EIR (USACE 2000) should be applied during the project. These include the following for all sites, except where indicated:

1. No construction work shall be conducted anywhere in the estuary at the Mason Bridge site from December 1st to June 1st.

2. Construction activities shall not begin until spring smolts have moved downstream out of the work area. Even so, prior to any construction activities at either bridge location, a qualified biologist shall survey the creek for the presence of steelhead of any life stage. If steelhead are present, they shall be relocated in accordance with the provisions detailed in the existing Biological Opinions.

3. No activities shall take place below the top of bank until the diversion/dewatering system is in place. These systems shall consist of culverts, nets, and screens, as detailed in the approved work plans, dependent on bridge construction location (USACE 2000d); see Figures.

4. The amount of in-stream disturbance shall be the minimum amount necessary to allow construction to take place. Temporary fencing shall be used to delineate the work area, and no vegetation removal shall be allowed outside of this area. All construction materials shall be stored within the dewatered portion of the channel or at the top of bank in preapproved locations; no vegetation removal shall occur for this purpose.

5. A storm water pollution prevention plan (SWPPP) shall be prepared with specific best management practices (BMPs) incorporated to control sedimentation and turbidity.

6. A revegetation plan shall be developed to facilitate the replacement of riparian habitat disturbed during construction, which is anticipated for the Cota Street Bridge and Mason Street Bridge replacements. The native landscaping shall be part of the larger LMCFCP, as detailed in the Lower Mission Creek Environmental Impact Statement/Environmental Impact Report ([EIS/EIR]; USACE, 2000d); incorporating

revegetation into the larger LMCFCP was approved by the California Coastal Commission during review of the Coastal Development Permit application (City of Santa Barbara Public Works Dept., 2010c).

Several minimization measures are specified for portions of Mission Creek, as detailed below.

Construction between Cabrillo Boulevard and Yanonali Street (applicable to Mason Street Bridge) will follow these minimization measures during stream diversion and dewatering, as detailed in the LMCFCP mitigation monitoring plan (USACE 2000d):

1. A qualified biologist familiar with aquatic species native to Mission Creek shall be present during the diversion operations.

2. Two rows of sheet piling or equivalent shall be placed in the approximate middle of the stream about 1 foot (0.3 m) apart and vibrated or driven to adequate depth into the lagoon floor by equipment on the creek bank. Alternatively, the double row of sheet piles would be inserted parallel and closer to the bridge abutments on both sides of the creek so as not to temporarily restrict the creek width to less than 10 feet.

3. A barrier (sheet piles, sand bags, or equivalent) shall be placed on the upstream side between the end of the row of sheet piles and the creek bank in order to block one end of the diversion.

4. A qualified biologist shall walk downstream in a zigzag pattern to herd as many fish as possible from the incipient enclosure

5. Fish biologists shall seine the entire contained half thoroughly to move any gobies and other large organisms to the wet side of the construction enclosure.

6. After sufficient effort has been completed to move fish out side of the diversion area, the downstream end blocking nets shall be installed to cordon off the area and the area shall be blocked off to water in a manner similar to the upstream side.

7. The portion of the lagoon that has been enclosed shall be seined by the biologist to capture any remaining fish; any remaining fish shall be relocated outside the enclosed area in the lagoon.

8. Pumps with 1/8-inch mesh screening to prevent fish entrainment shall be used to dewater the area. Water quality shall be maintained by pumping into a bladder(s), for discharge into the lagoon, when water quality warrants, or to a tank for storage and hauling off-site, if water quality is below that of receiving waters.

9. Fish biologists shall monitor the drying enclosure and seine it thoroughly at least twice a week.

10. When construction on one side has been completed, the downstream wall of the enclosure shall be removed first, followed by the upstream end.

11. The above steps shall be repeated for the opposite bank construction.

Construction between Highway 101 and Canon Perdido Street (applicable to Cota Street Bridge)

1. No mechanized equipment shall be permitted in water between December 1^{st} and the end of March.

2. If continuous flows greater than one-half inch (1.3 cm) deep occur through the Caltrans portion of Mission Creek between April 1^{st} and June 1^{st}, operation of mechanized equipment in the stream channel shall cease and may not resume until steady flows have dropped below that threshold.

3. Prior to starting work in the next region upstream, a qualified biologist shall examine all scour pools and bridge abutments, undercut concrete ledges, etc.

4. Any steelhead or young salmonid fish found unexpectedly in these small refuges shall be relocated upstream to a preapproved receiving area; this receiving area shall be identified and agreed upon by NMFS and CDFG prior to project initiation. Relocation of fish shall be conducted in a manner thoroughly consistent with appropriate transportation techniques. As recommended by the USACE in the initial Biological Assessment, if authorized, the monitor shall weigh and measure each salmonid discovered, remove a sample of cheek scales, remove a sample of adipose fin, and apply a permanent identification tag of acceptable properties.

5. The biological monitor shall prepare a written report summarizing all pertinent details of fish relocation activities.

6. Silt curtains shall be deployed below the immediate construction area. Curtains shall be deployed in pairs, with a gap at least 30 feet (10 m) wide between the

upstream and the downstream curtain, to reduce suspended sediments in the water.

7. A temporary net with 1/4-inch mesh (or as agreed upon by NMFS and CDFG), shall be strung across the existing low-flow channel to prevent salmonids from entering the section of creek targeted for upcoming construction.

8. Once the construction area is certified as being free of protected fish individuals, the existing current shall be diverted to a temporary pilot channel that shall be scored in the center of the creek bed.

9. As many culvert pipes as determined necessary to carry anticipated low flows (at least 40 feet 3/sec capacity) shall be placed into the pilot channel. Culverts shall be at least 24 inches (0.6 m) in diameter. All joints between culverts shall be smooth, and the lining of each culvert shall also be smooth to the touch.

10. Once culverts have been placed, the biologist shall monitor each section at least twice a week to verify that screens are in place over intakes, and water has not leaked into the local section under construction.

11. Prior to completion of work in a given section, the temporary net shall be resuspended upstream of the culvert intake and fully across the existing low flow channel.

12. Only then shall removal of the culvert and completion of the natural streambed downstream be allowed.

13. The pair of silt curtains shall then be removed.

14. The next upstream segment of the creek bed and banks shall be readied in a similar manner.

4.2.1.4 Steelhead Project Effects

This section describes the potential effects of the proposed project on steelhead and its associated critical habitat at each bridge replacement location. The effects have not changed from those described in the LMCFCP Biological Assessments (USACE 2000b; USACE 2000c).

4.2.1.4.1 Chapala Street Bridge Effects on Steelhead

The Chapala Street Bridge Removal will entail removal of the concrete channel bottom within 10 feet (3 m) of the new wall and may exclude that portion of the bridge that is supported by the triangular end span on the railroad side of the bridge.

The effects of the proposed project on steelhead and steelhead critical habitat are those associated with the temporary diversion of the creek and dewatering of the work areas so that construction activities can take place under dry conditions. Potential effects are anticipated to be minimal, since the existing concrete channel provides little in the way of habitat for flora and fauna. Potential effects are likely to involve the temporary loss, alteration, and reduction of aquatic habitat; loss and alteration of the aquatic insect assemblage; loss of riparian vegetation; and sedimentation and turbidity if adequate minimization measures are not implemented. Any steelhead subjected to netting and re-location for their own well-being would be subject to adverse and temporary effects. If required, limited removal of vegetation from the creek banks may result in loss of canopy cover over the creek and could result in temporary loss of shade.

Based on engineering drawings, the limits of temporary creek disturbance for the Chapala Street Bridge replacement project will be approximately 850 square feet (79 square meters). Approximately 160 linear feet (49 meters) of channel will be dewatered during the project. The construction window is eight months.

4.2.1.4.2 Cota Street Bridge Effects on Steelhead

The effects of the proposed project on steelhead and steelhead critical habitat are those associated with the temporary diversion of the creek and dewatering of the work areas so that construction activities can take place under dry conditions. Potential effects are likely to involve the temporary loss, alteration, and reduction of aquatic habitat; loss and alteration of the aquatic insect assemblage; loss of riparian vegetation; and sedimentation and turbidity, if adequate minimization measures are not implemented. Any steelhead subjected to netting and re-location for their own well-being would be subject to adverse and temporary effects. If required, limited removal of vegetation from the creek banks may result in loss of canopy cover over the creek and could result in temporary loss of shade.

Based on engineering drawings, the limits of temporary creek disturbance for the Cota Street Bridge replacement project will be approximately 12,000 square feet (0.28 acre), or approximately 1,115 square meters (0.11 ha). Approximately 280 linear feet (85 meters) would be dewatered during construction. The construction window is eight months.

4.2.1.4.3 Mason Street Bridge Effects on Steelhead

The effects of the proposed action on steelhead and steelhead critical habitat are those associated with the temporary diversion of the creek and dewatering of the work areas so that construction activities can take place under dry conditions. Potential effects are likely to involve the temporary loss, alteration, and reduction of aquatic habitat; loss and alteration of the aquatic insect assemblage; loss of riparian vegetation; and sedimentation and turbidity, if adequate minimization measures are not implemented. Any steelhead subjected to netting and re-location for their own well-being would be subject to adverse and temporary effects.

The vegetation here is a mix of native and non-native species that will quickly be reestablished without planting. A dead palm tree will be removed on the upstream side of the bridge and an overhanging trunk of a sycamore tree will be removed on the downstream side, with the remainder of the tree protected in place. If required, limited removal of vegetation from the creek banks may result in loss of canopy cover over the creek and could result in temporary loss of shade.

Based on engineering drawings, the limits of temporary creek disturbance for the Mason Street Bridge replacement project will be approximately 900 square feet (84 square meters). Approximately 220 linear feet (67 meters) of channel will be dewatered. The construction window is six months between June 1 and December 1. It is anticipated that the work will be completed during a single work window, however, if work is delayed, it would be completed during the same window the following year.

4.2.1.5 Modification of Project to Mitigate Effects on Steelhead

Slight changes have been made to habitat enhancement measures since the LMCFCP Biological Opinions were issued. Appendix E provides select figures from the existing project documentation showing channel enhancements; comprehensive detailed descriptions and figures occur in the source documents referenced below. These consist of the following:

- Ledge in estuary – The Lower Mission Creek Flood Control EIS/EIR proposes a bench or ledge to be built along the stream banks for steelhead cover (to mimic an undercut bank). This measure is still proposed for implementation, but the overall sequence of projects has changed so it will not be done prior to the three bridge replacements described herein. Additionally, there are questions as to the final elevation of the ledge, considering the significant fluctuation in the width and depth of the creek through the year.
- Boulder clusters – The Lower Mission Creek Flood Control EIS/EIR proposes clusters of boulders in the channel. At one time they were proposed along the banks, but now the clusters are proposed to be scattered throughout the channel.
- Riffle pools – In the Lower Mission Creek Flood Control EIS/EIR, creation of a low flow channel is proposed; however, the Channel Design Recommendations were for a series of riffle pools and the Coastal Commission subsequently required the riffle pools. The Channel Design Recommendations for the channel will be implemented following bridge construction north of Highway 101.

4.2.1.6 Cumulative Effects on Steelhead

Multiple restoration projects are proposed for Mission Creek, the largest of which is the LMCFCP, and these will result in temporary adverse effects to steelhead and steelhead critical habitat. The proposed projects are identified in Appendix F. Expected effects are likely to involve the temporary loss, alteration, and reduction of aquatic habitat; loss and alteration of the aquatic insect assemblage; loss of riparian vegetation; and sedimentation and turbidity, if adequate minimization measures are not implemented. Any steelhead subjected to netting and re-location for their own well being would be subject to adverse and temporary effects, Vegetation removal may result in temporary loss of shade over limited portions of Mission Creek. These effects are expected to be short-term in extent from individual components of the LMCFCP and other restoration projects but could result in long term effects to steelhead and steelhead critical habitat if construction occurred along the creek at the same time for all projects within Mission Creek. The timing of project work to avoid multiple projects occurring during the same or over a short period will greatly reduce any cumulative effects that might occur. Most of the projects identified in Appendix F are still in the design phase and are without funding. Consequently, significant cumulative construction impacts are not expected and the long-term cumulative impacts of the collective habitat restoration projects are beneficial.

4.2.2 Tidewater Goby

The summary of tidewater goby is excerpted from the Tidewater Goby Management Plan prepared for the LMCFCP (URS 2005):

> *Lower Mission Creek is subject to tidal influence up to Yanonali Street. The extent of tidal influence is dependent upon conditions at the beach. In the summer and fall, a lagoon forms on the beach at the mouth of the creek. In the winter, the mouth of the creek is open to the ocean because runoff breaches the sandbar that forms the lagoon. When the creek is open to the ocean, high tides flow into the creek and can reach the concrete sill at Chapala Street Bridge near Yanonali Street. Hence, the entire reach is considered Mission Creek estuary, although the extent of tidal influence is highly limited. The waterbody downstream of Cabrillo Boulevard is called the Mission Creek Lagoon. Hence, the term estuary or estuarine reach refers to all tidally influenced portions of the creek, while the lagoon only refers to the waterbody south of Cabrillo Boulevard.*
>
> *A permanent population of tidewater gobies occurs in the estuary. There are few data on the relative abundance of the species and its distribution in the estuary. Surveys of limited extent have been conducted throughout the 1990s, and in 2000 and 2002 by various investigators. A report on the occurrence of the gobies was prepared in 2000 by Cam Swift (Swift, 2000). In 2004, the City Parks and Recreation Department,*

Creeks Division, initiated a two-year creek monitoring study on the estuarine reach of Mission Creek, including the lagoon that included goby surveys (ECORP, 2005).

A summary of the current state of knowledge about the occurrence of gobies and the condition of their habitat in the estuarine reach is presented here. Throughout the estuary, water temperatures, salinity, and depth are suitable for gobies. The substrate upstream of the State Street Bridge appears to be comprised of cobbles, which would preclude or limit spawning. The substrate downstream of State Street Bridge is comprised of fine to coarse sands, which is suitable for goby spawning. Observations and sampling data collected to date indicate that most of the gobies are located in the portion of the estuary immediately above and below the Cabrillo Boulevard Bridge. Emergent vegetation is sparse in most of the estuary and absent from the lagoon, which would limit overall goby abundance.

Knowledge of the following issues is limited: (1) most favorable locations for spawning and foraging; (2) primary habitat factors (temperature, cover, salinity, etc) that affect goby abundance and distribution; (3) means by which gobies avoid being washed to the ocean during storm events; and (4) year to year and seasonal population fluctuations.

Quantitative sampling of gobies in Mission Creek estuary was conducted by the Creeks Division in 2004; results are reported in ECORP (2005). Fish seining was conducted at three locations in the estuary during the months of June, September, and November 2004. The locations included the following:

Lower Estuary – about middle of the lagoon on the beach

Middle Estuary – between Cabrillo Boulevard and State Street

Upper Estuary – immediately below the Mason Street Bridge

During each sampling event, a beach seine (33 feet [10 m] in length, 1/8 inch [0.3 cm] mesh) was deployed about 25 feet (8 m) from shore and pulled onto the adjacent shore. All fish were collected and identified into species and size classes. The results of the 2004 survey for gobies are summarized below:

June 2004: Lower Estuary (43); Middle Estuary (183); Upper Estuary (38)

September 2004: Lower Estuary (17); Middle Estuary (8); Upper Estuary (0)

November 2004: Lower Estuary (0); Middle Estuary (0); Upper Estuary (0)

The surveys show that gobies occur in low abundance in the upper estuary and in the lagoon. Gobies were most abundant between the lagoon and State Street Bridge. Gobies were also more abundant in the spring compared to the late summer. At this time, there is insufficient information to explain these observations or to identify trends or patterns.

In addition, a genetic study of the Mission Creek tidewater goby population provides detailed data on this local population (Jacobs et. Al 2005), and an Entrix (2008) survey reported successful tidewater goby spawning prior to May with primarily young fish present at the time of survey. Abundance was greatest just below Cabrillo Boulevard in May and above State Street in August, with very high numbers near the Laguna Channel tidegate (Mission Creek Lagoon was connected with Laguna Channel Lagoon). Overall abundance was estimated to be 22 fish per square meter (SAIC 2009).

4.2.2.1 Tidewater Goby Survey Results

Tidewater goby have been documented in Mission Creek in previous years (URS 2005; SAIC 2009; CNDDB 2010), but tidewater goby surveys in Mission Creek were not conducted as part of this biological assessment. However, Mission Creek continues to possess all of the PCEs of critical habitat (see 4.3.1.2 below) for tidewater goby, and tidewater goby are present in the creek at this time.

4.2.2.2 Tidewater Goby Critical Habitat

Revised critical habitat designation for the tidewater goby in 2008 includes the Mission Creek lagoon, which is designated as critical habitat unit "SB-9: Mission Creek – Laguna Channel." SB-9 consists of 14 acres (6 ha) at the estuary and mouth of Mission Creek. None of the three bridge locations occur within the designated critical habitat. Critical habitat, as defined by the USFWS, includes the following primary constituent elements for the tidewater goby:

1. Persistent, shallow (in the range of about 0.3 feet to 6 feet [0.1 to 2 m]), still-to-slow-moving, aquatic habitat; salinity ranges most common between 0.5 ppt to about 10 to 12 ppt; and adequate space for normal behavior, individual development, and population growth;

2. Substrates (e.g., sand, silt, mud) suitable for the construction of burrows for reproduction;

3. Submerged and emergent aquatic vegetation, such as pondweed (*Potamogeton pectinatus*), ditchgrass (*Ruppia maritima*), cattail (*Typha latifolia*), and bulrush (*Scirpus*, *Bolboshoenus*, and *Schoenoplectus* species), that provides protection from predators;

4. Presence of a sandbar(s) across the mouth of a lagoon or estuary during the late spring, summer, and fall that closes or partially closes the lagoon or estuary, thereby providing relatively stable water levels and salinity.

The following is a description of critical habitat unit "SB-9: Mission Creek – Laguna Channel" as presented in the Federal Register dated 1-31-2008 (Volume 73, Number 21) Page 5919-6006:

> *Unit SB-9 consists of 14 acres (6 ha) located on the southern margin of the city of Santa Barbara. On an intermittent basis, SB-9 possesses a sandbar across the mouth of the lagoon or estuary during the late spring, summer, and fall that closes or partially closes the lagoon or estuary and thereby provides relatively stable conditions (PCE 4). PCEs 1, 2, and 3 occur throughout the unit, although their precise location during any particular time period may change in response to seasonal fluctuations in precipitation and tidal inundation. A portion of this unit is owned by the city of Santa Barbara, and remainder is privately owned.*
>
> *SB-9 was occupied at the time of listing, is currently occupied, and is likely a source population for this region. SB-9 is the southernmost of the nine Santa Barbara County units and is located 2.8 miles (4.5 km) south of Arroyo Burro (SB-8). The unit is separated from the nearest extant population to the south, in Sycamore Creek (not designated as critical habitat), by 1.0 mile (1.5 km). This unit will support the recovery of the tidewater goby population along this portion of the coast and help facilitate colonization of currently unoccupied locations.*

4.2.2.3 Tidewater Goby Avoidance and Minimization Efforts

ARCADIS concurs that all of the original avoidance and minimization measures described in the Mason Street Bridge portion of the Lower Mission Creek Flood Control EIS/EIR (USACE 2000) should be applied during the project. These include the following:

1. No construction work shall be allowed in water anywhere in the estuary from December 1^{st} to June 1^{st}.

2. Construction activities shall not begin until spring smolts have moved downstream out of the work area. Even so, prior to any construction activities, a USFWS-approved biologist shall survey the creek for the presence of tidewater goby of any life stage. If tidewater goby are present, they shall be relocated in accordance with the provisions detailed in the existing Biological Opinions.

3. No activities shall take place below the top of bank until the diversion/dewatering system is in place. These systems shall consist of culverts, nets, and screens, as

detailed in the approved work plans, dependent on bridge construction location (USACE 2000d); see Figures.

4. The amount of in-stream disturbance shall be the minimum amount necessary to allow construction to take place. Temporary fencing shall be used to delineate the work area, and no vegetation removal shall be allowed outside of this area. All construction materials shall be stored within the dewatered portion of the channel or at the top of bank in preapproved locations; no vegetation removal shall occur for this purpose.

5. A storm water pollution prevention plan (SWPPP) shall be prepared with specific best management practices (BMPs) incorporated to control sedimentation and turbidity.

6. A revegetation plan shall be developed to facilitate the replacement of riparian habitat disturbed during construction, which is anticipated for the Mason Street Bridge replacement. The native landscaping shall be part of the larger LMCFCP, as detailed in the Lower Mission Creek Environmental Impact Statement/Environmental Impact Report ([EIS/EIR]; USACE, 2000d); incorporating revegetation into the larger LMCFCP was approved by the California Coastal Commission during review of the Coastal Development Permit application (City of Santa Barbara Public Works Dept., 2010c).

Several minimization measures are specified for portions of Mission Creek, as detailed below.

Construction between Cabrillo Boulevard and Yanonali Street (applicable to Mason Street Bridge) will follow these minimization measures during stream diversion and dewatering, as detailed in the LMCFCP mitigation monitoring plan (USACE 2000d):

1. A USFWS-approved biologist familiar with aquatic species native to Mission Creek shall be present during the diversion operations.

2. Two rows of sheet piling or equivalent shall be placed in the approximate middle of the stream about 1 foot apart and vibrated or driven to adequate depth into the lagoon floor by equipment on the creek bank. Alternatively, the double row of sheet piles would be inserted parallel and closer to the bridge abutments on both sides of the creek so as not to temporarily restrict the creek width to less than 10 feet.

3. A barrier (sheet piles, sand bags, or equivalent) shall be placed on the upstream side between the end of the row of sheet piles and the creek bank to block one end of the diversion.

4. A qualified biologist shall walk downstream in a zigzag pattern to herd as many fish as possible from the incipient enclosure

5. Fish biologists shall seine the entire contained half thoroughly to remove any gobies and other large organisms to the wet side of the construction enclosure.

6. After sufficient effort has been completed to move fish out side of the diversion area the downstream end blocking nets shall be installed to cordon off the area and the area shall be blocked off to water in a manner similar to the upstream side.

7. The portion of the lagoon that has been enclosed shall be seined by the biologist to capture any remaining fish and any remaining fish shall be relocated outside the enclosed area in the lagoon.

8. Pumps with 1/8-inch sized screening shall be used for all dewatering. Water shall be pumped into a bladder(s), for discharge into the lagoon, when water quality warrants or to a tank for storage and off hauling if water quality is below that of receiving waters.

9. Fish biologists shall monitor the drying enclosure and seine it thoroughly at least twice a week.

10. When construction on one side has been completed, the downstream wall of the enclosure shall be removed first, followed by the upstream end.

11. The above steps shall be repeated for the opposite bank construction.

Construction between Highway 101 and Canon Perdido Street (applicable to Cota Street Bridge)

1. No mechanized equipment shall be permitted in water between December 1st and the end of March.

2. If continuous flows greater than one-half inch (1.3 cm) deep occur through the Caltrans portion of Mission Creek between April 1st and June 1st, operation of

mechanized equipment in the stream channel shall cease and may not resume until steady flows have dropped below that threshold.

3. Prior to starting work in the next region upstream, a USFWS-approved biologist shall examine all scour pools and bridge abutments, undercut concrete ledges, etc.

4. The biological monitor shall prepare a written report summarizing all pertinent details of fish relocation activities.

5. Silt curtains shall be deployed below the immediate construction area. Curtains shall be deployed in pairs, with a gap at least 30 feet (10 m) wide between the upstream and the downstream curtain, to reduce suspended sediments in the water.

6. Once the construction area is certified as being free of protected fish individuals, the existing current shall be diverted to a temporary pilot channel that shall be scored in the center of the creek bed.

7. As many culvert pipes as determined necessary to carry anticipated low flows (at least 40 feet 3/sec capacity) shall be placed into the pilot channel. Culverts shall be at least 24 inches (0.6 m) in diameter. All joints between culverts shall be smooth, and the lining of each culvert shall also be smooth to the touch.

8. Once culverts have been placed, the biologist shall monitor each section at least twice a week to verify that screens are in place over intakes, and water has not leaked into the local section under construction.

9. Prior to completion of work in a given section, the temporary net shall be resuspended upstream of the culvert intake and fully across the existing low flow channel.

10. Only then shall removal of the culvert and completion of the natural streambed downstream be allowed.

11. The pair of silt curtains shall then be removed.

12. The next upstream segment of the creek bed and banks shall be readied in a similar manner.

4.2.2.4 *Project Effects on Tidewater Goby*

This section describes the potential effects of the proposed project on tidewater goby and its associated critical habitat at each bridge replacement location. The effects have not changed from those described in the LMCFCP Biological Assessments (USACE 2000b; USACE 2000c). All of the bridge locations occur outside designated critical habitat for the tidewater goby.

4.2.2.4.1 Chapala Street Bridge Effects on Tidewater Goby

No tidewater goby are likely to occur upstream as far as the Chapala Street Bridge.

The Chapala Street Bridge Removal will entail removal of the concrete channel bottom within 10 feet (3 m) of the new wall. Based on engineering drawings, the limits of temporary creek disturbance for the Chapala Street Bridge replacement project will be approximately 850 square feet (79 square meters). Approximately 160 linear feet (49 meters) of channel will be dewatered during the project. The construction window is eight months.

The potential effects of the proposed project on tidewater goby and its critical habitat from this location would be indirect in association with downstream sedimentation or turbidity.

4.2.2.4.2 Cota Street Bridge Effects on Tidewater Goby

No tidewater goby are expected near the Cota Street Bridge.

Based on engineering drawings, the limits of temporary creek disturbance for the Cota Street Bridge replacement project will be approximately 12,000 square feet (0.28 acre), or approximately 1,115 square meters (0.11 ha). Approximately 280 linear feet (85 meters) would be dewatered during construction. The construction window is eight months.

Potential effects to tidewater goby could include migration of sedimentation and turbidity to downstream locations, if adequate minimization measures are not implemented.

4.2.2.4.3 Mason Street Bridge Effects on Tidewater Goby

The effects of the proposed action on tidewater goby and its critical habitat are those associated with the temporary diversion of the creek and dewatering of the work areas so that construction activities can take place under dry conditions. Potential effects are likely to involve the temporary loss, alteration, and reduction of aquatic habitat; loss and alteration of the aquatic insect assemblage, loss of riparian vegetation; and sedimentation and turbidity, if adequate minimization measures are not implemented. Any tidewater goby subjected to netting and re-location for their own well being would be subject to adverse and temporary effects.

Based on engineering drawings, the limits of temporary creek disturbance for the Mason Street Bridge replacement project will be approximately 900 square feet (84 square meters). Approximately 220 linear feet (67 meters) of channel will be dewatered. The construction window is six months between June 1 and December 1. It is anticipated that the work will be completed during a single work window, however, if work is delayed, it would be completed during the same window the following year.

The vegetation here is a mix of native and non-native species that will quickly be reestablished without planting. A dead palm tree will be removed on the upstream side of the bridge and an overhanging limb of a sycamore tree will be removed on the downstream side with the remainder of the tree protected in place.

4.2.2.5 Modification of Project to Mitigate Effects on Tidewater Goby

Slight changes have been made to habitat enhancement measures since the LMCFCP Biological Opinions were issued. These consist of the following:

- <u>Refugia for tidewater goby during high flow</u> – The Lower Mission Creek Flood Control EIS/EIR proposed some "ribs" in channel walls to create flow disturbance that would provide tidewater goby refugia during high flow events. The project hydrologist determined that the ribs might not be effective in that situation, but that grooves in the walls would allow tidewater goby to get out of the main flow and into slower water. As such, the project will include grooves in the grout of the wall rather than the previously proposed ribs.
- <u>Boulder clusters</u> –The Lower Mission Creek Flood Control EIS/EIR proposes clusters of boulders in the channel. At one time they were proposed along the banks, but now the clusters are proposed to be scattered throughout the channel.

4.2.2.6 Cumulative Effects on Tidewater Goby

Multiple restoration projects are proposed for Mission Creek, the largest of which is the LMCFCP, and these will result in temporary adverse effects to tidewater goby and potential indirect impacts to their designated critical habitat. The proposed projects are identified in Appendix F. Expected effects are likely to involve the temporary loss, alteration, and reduction of aquatic habitat; loss and alteration of the aquatic insect assemblage; loss of riparian vegetation; and sedimentation and turbidity, if adequate minimization measures are not implemented. Any fish subjected to netting and re-location for their own well being would be subject to adverse and temporary effects, Vegetation removal may result in temporary loss of shade over limited portions of Mission Creek. These effects are expected to be short-term in extent from individual components of the LMCFCP and other restoration projects but could result in long term effects to tidewater goby and tidewater goby critical habitat if construction occurred along the creek at the same time for all projects within Mission Creek. The timing of project work to avoid multiple projects occurring during the same or over a short period will greatly reduce any cumulative effects that might occur. Most of the projects identified in Appendix F are still in the design phase and are without funding. Consequently, significant cumulative construction impacts are not expected and the long-term cumulative impacts of the collective habitat restoration projects are beneficial.

5. Conclusions and Determination

Based on the 2010 ARCADIS field survey and review of previous and recent documents for the project, the compendium of biological information presented in previous biological assessments for the LMCFCP is still applicable to the current project of replacing the Mason Street, Chapala Street, and Cota Street Bridges along Mission Creek in Santa Barbara, California. Original avoidance and minimization measures remain the same, and the Reasonable and Prudent Measures and Terms and Conditions described in the existing Biological Opinions will be followed. Proposed native plant restoration is expected to enhance riparian habitats and water quality.

There have been slight changes to habitat enhancement measures (described above) from what was previously described in earlier BAs, and tidewater goby critical habitat has been revised to include the Mission Creek lagoon. Avoidance/minimization measures from the LMCFCP EIS/EIR remain the same, and adherence to the Reasonable and Prudent Measures and Terms and Conditions described in the USFWS BO for protection of steelhead and in the NMFS BO for protection of tidewater goby will be required.

Several proposed aspects of the project will enhance habitat values for these endangered species. These include:

1. Enhancement of soft channel bottoms at the Mason and Cota Street Bridges: Natural soft channel bottoms, especially those with diverse sediment types, provide rough surfaces and sediments as habitat for invertebrate populations, as well as favorable conditions for fish foraging and upstream migration and foraging.

2. Riffle pools and stretches: Riffles consist of a shallow stretch of stream with above-average stream velocity, often consisting of a bed of gravel and various sized rocks. These conditions provide favorable habitats for aquatic invertebrates and juvenile fish. Creation of riffles is planned for the Mission Creek channel in places above Highway 101; plans for the potential creation of riffles at the. Cota Street Bridge have not been included in the project at this time.

3. Expansion of estuary: An expanded estuary will provide greater area for smolts to reside and greater water volume in which to hide from predators.

4. Refugia for tidewater goby during high flow: Grooves built into the estuary walls may reduce water flow and allow tidewater goby to get out of the main flow and into slower water.

5. Ledges along estuary and stream walls: Ledges along walls of the estuary and creek provide sheltered overhangs as resting places for fish along with protection from predators; ledges shade the water and reduce local water temperatures in a given location. Ledges along the stream also can promote scour pools where water may persist during dry periods.

6. Boulder clusters, baffles, and ridges in walls along estuary and stream: Like ledges, boulder clusters provide sheltered resting spots and a variety of microhabitats. Depending on the location, boulder clusters may be placed in low water at margins of water flow or mid-stream in the channel.

The project design incorporates an array of minimization measures designed to protect ecological resources associated with Mission Creek during the project, especially the tidewater goby and steelhead. Implementation of the recommended minimization and enhancement measures is expected to result in avoidance of significant impacts to biotic resources and to provide long-term enhancement of ecological functions along this urban portion of Mission Creek.

5.1 Steelhead Determination

With the precautions specified in this document and the referenced and incorporated documents, the project is not likely to adversely affect steelhead or designated steelhead critical habitat. Effects to steelhead and essential features of steelhead critical habitat are expected to be confined to the action area (dewatered portion of the creek). The proposed bridge replacements are not likely to jeopardize the continued existence of the federally endangered southern steelhead ESU and are not likely to destroy or adversely modify their critical habitat.

5.2 Tidewater Goby Determination

With the precautions specified in this document and the referenced and incorporated documents, the project is not likely to adversely affect tidewater goby or designated tidewater goby critical habitat. Effects to tidewater goby and essential features are expected to be confined to the action area (dewatered portion of the creek). None of the bridge locations are within designated critical habitat for this species. The proposed bridge replacements are not likely to jeopardize the continued existence of the federally-listed endangered tidewater goby, and are not likely to destroy or adversely modify their critical habitat.

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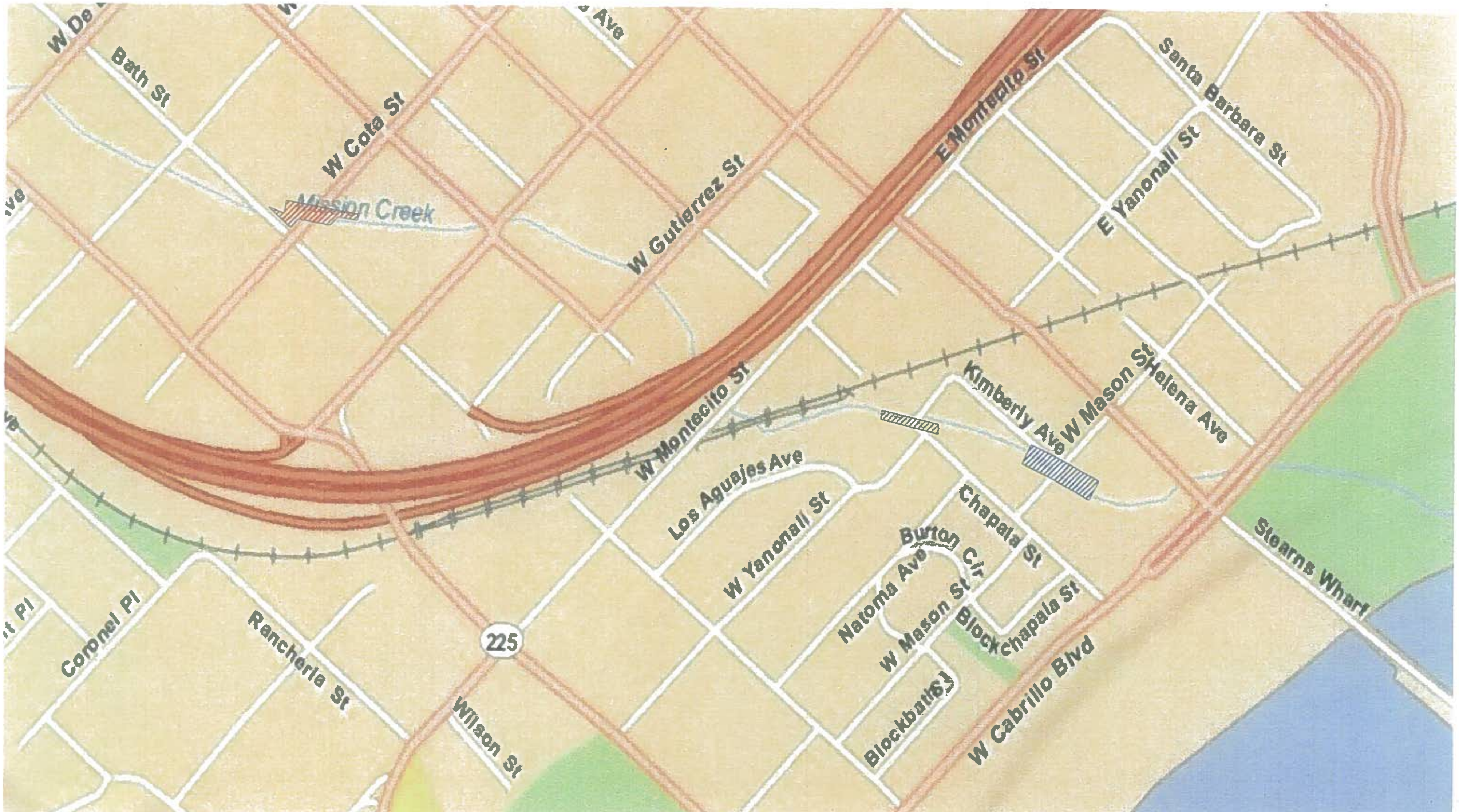


Bridge Replacement Projects

- Cota Street Bridge
- Chapala Street Bridge
- Mason Street Bridge

0 200 400 800 Feet

Map includes data from: multiple sources

Site Location Map

Santa Barbara Bridge Replacement Project

ARCADIS
infrastructure, environment, buildings

Figure 1

Figure 2 Chapala Street Bridge
Limits of Creek Disturbance

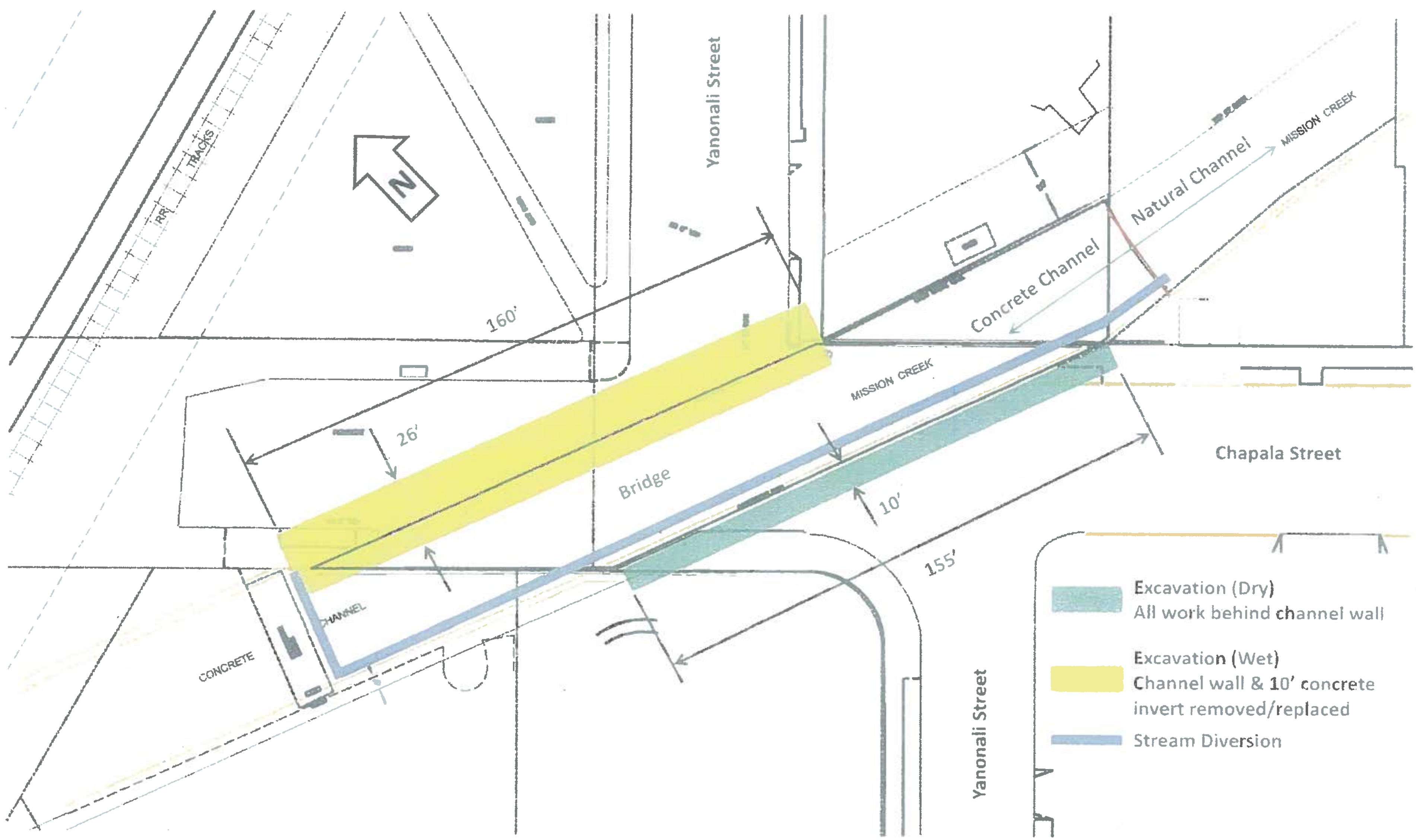


Figure 3 Chapala Street Bridge Engineering Layout

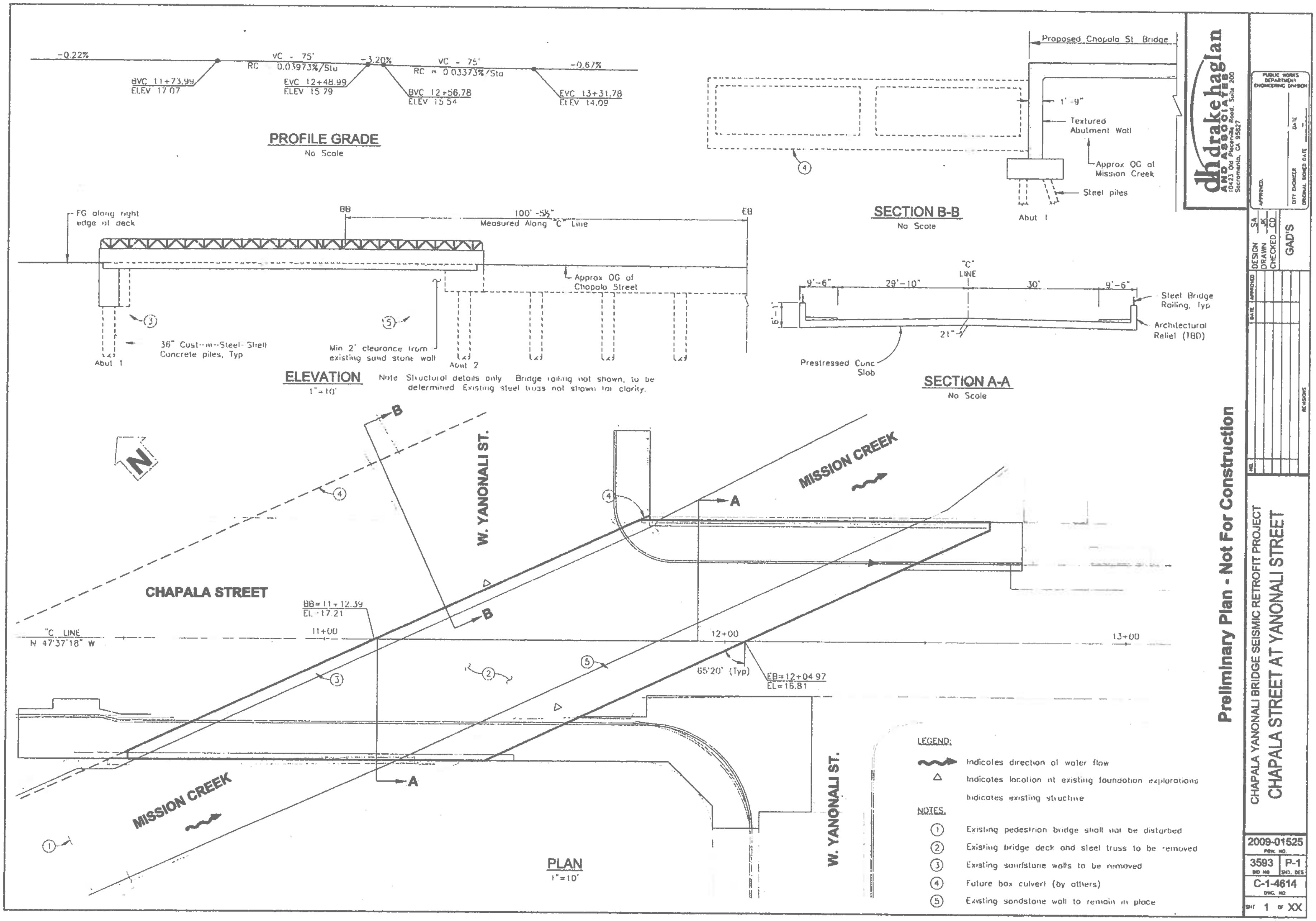


Figure 4 Chapala Street
and Cota Street Bridges

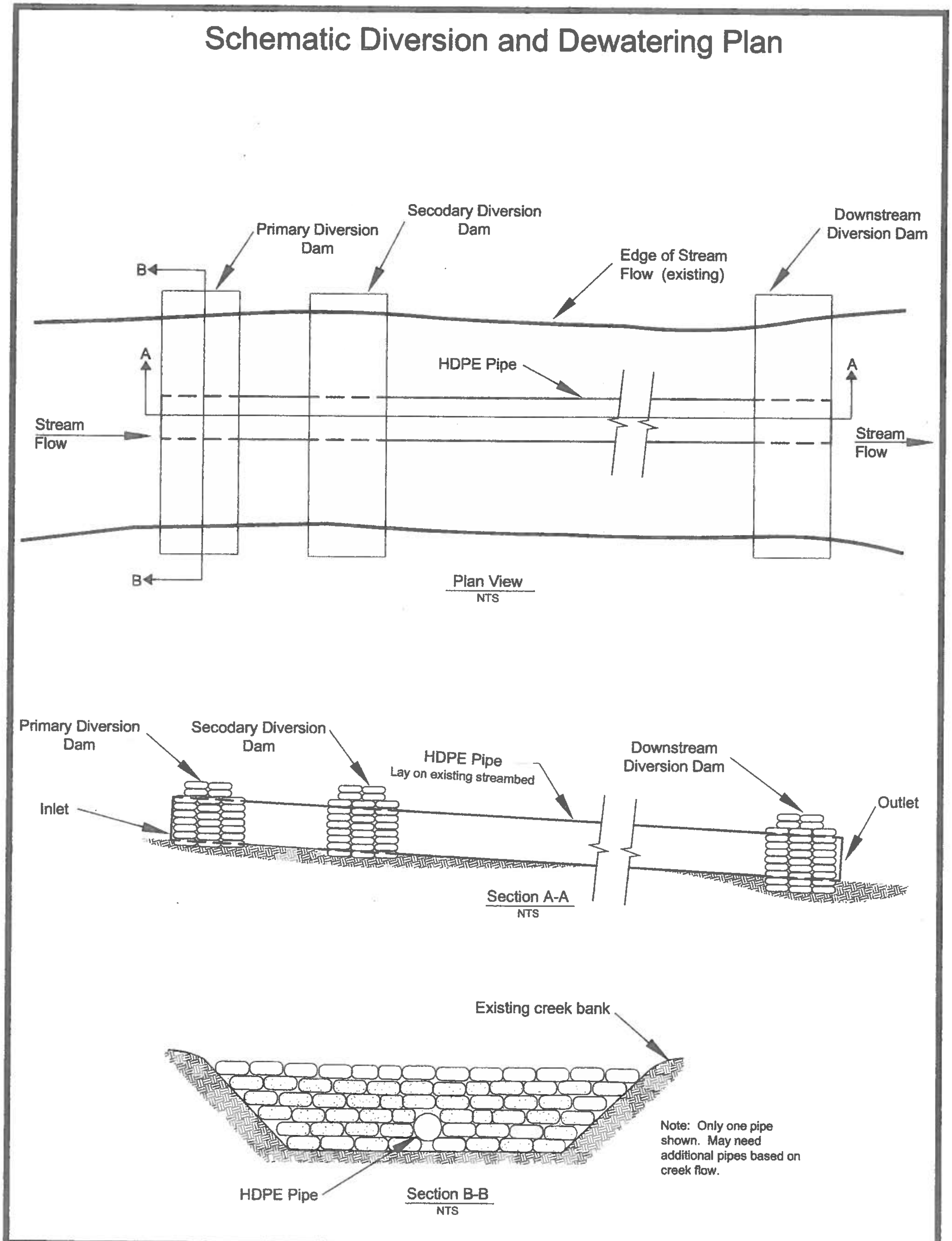
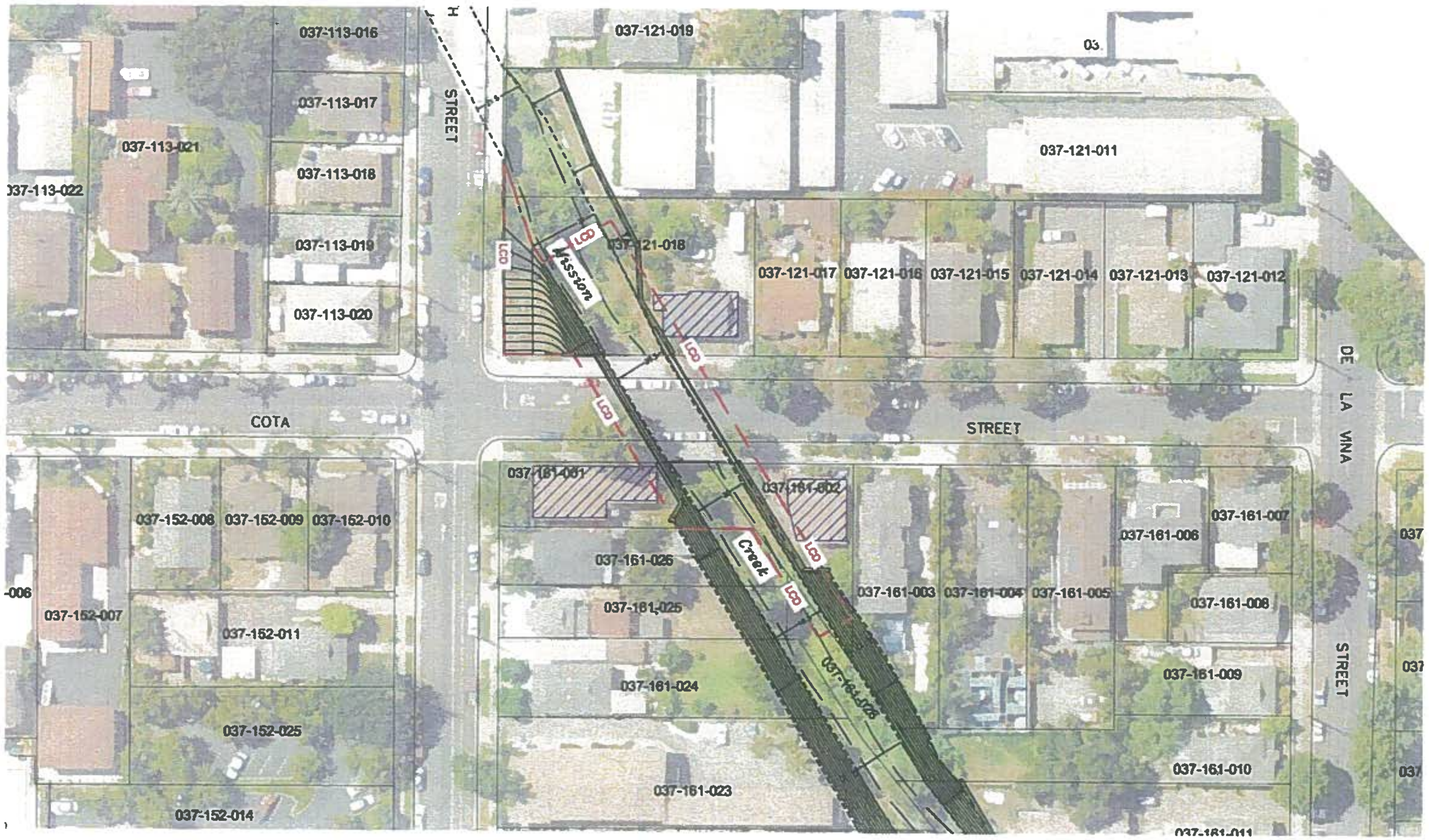


Figure 5 Cota Street Bridge
Limits of Creek Disturbance



NOTES:

1. The Lower Mission Creek Flood Control project channel grading and walls are shown, in Concept only, both upstream and downstream of the Cota St. bridge. The channel wall linework is by Others and subject to change.
2. Creek disturbance limits, as shown conceptually, do not include the Dewatering areas.

Legend

LCD = Potential Limits of Creek Disturbance

= Building to be Moved/Demolished (as part of the LMCFC Project)

033-xxx-xxx = Assessor's Parcel Number

Scale: 1" = 30'

LIMITS OF CREEK DISTURBANCE

COTA STREET BRIDGE REPLACEMENT
BRIDGE NO 51C-0246, BRLO *
SANTA BARBARA, CA

Reference:

Aerial Photo and Base Mapping provided by the City of Santa Barbara; photography dated Dec. 2004.

Bengal Engineering, Inc.
Civil, Bridge, Hydraulics, Structural & Highway Engineers

Plot Date: June 21, 2010

Figure 6 Cota Street Bridge
Engineering Layout

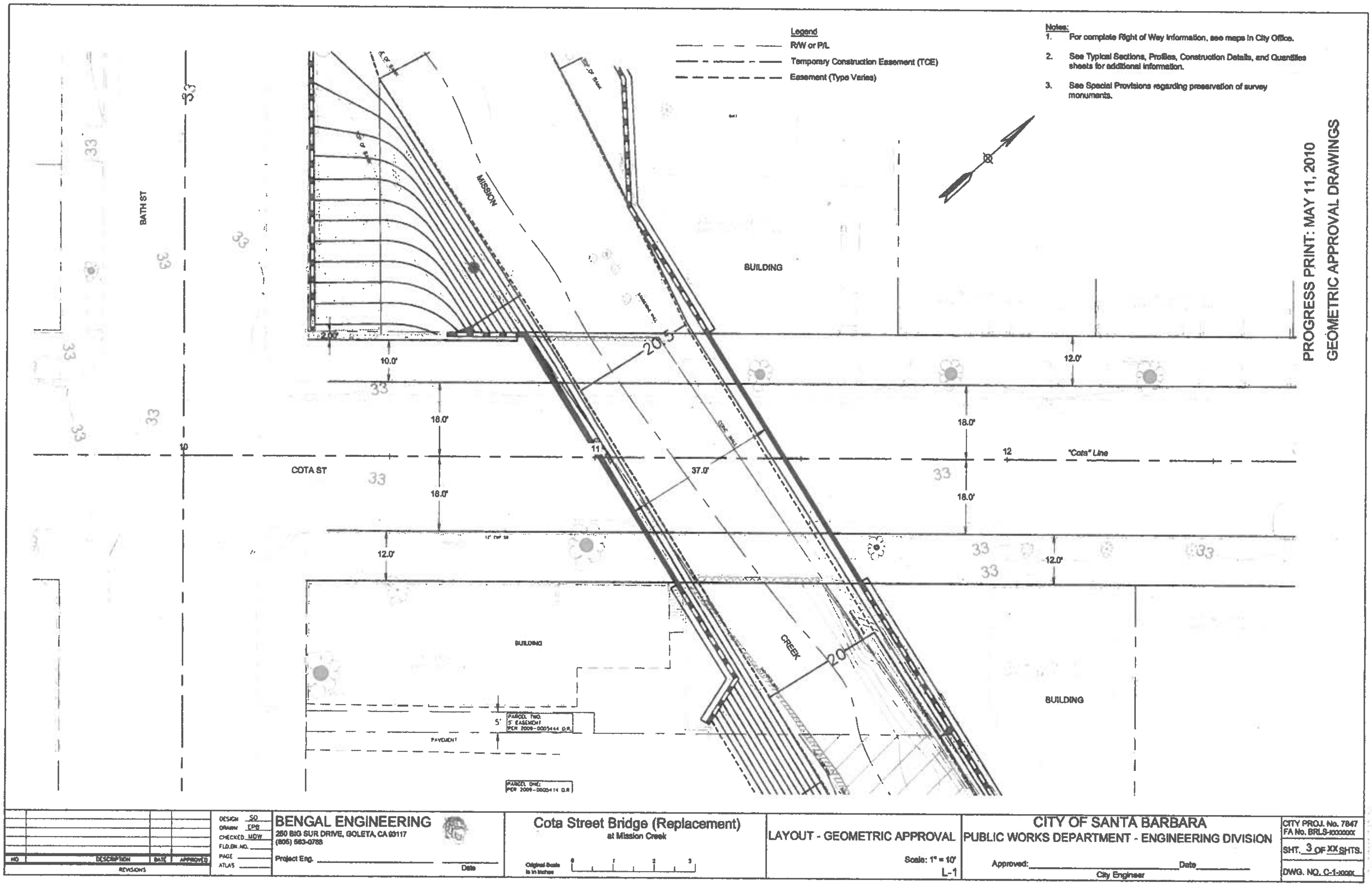
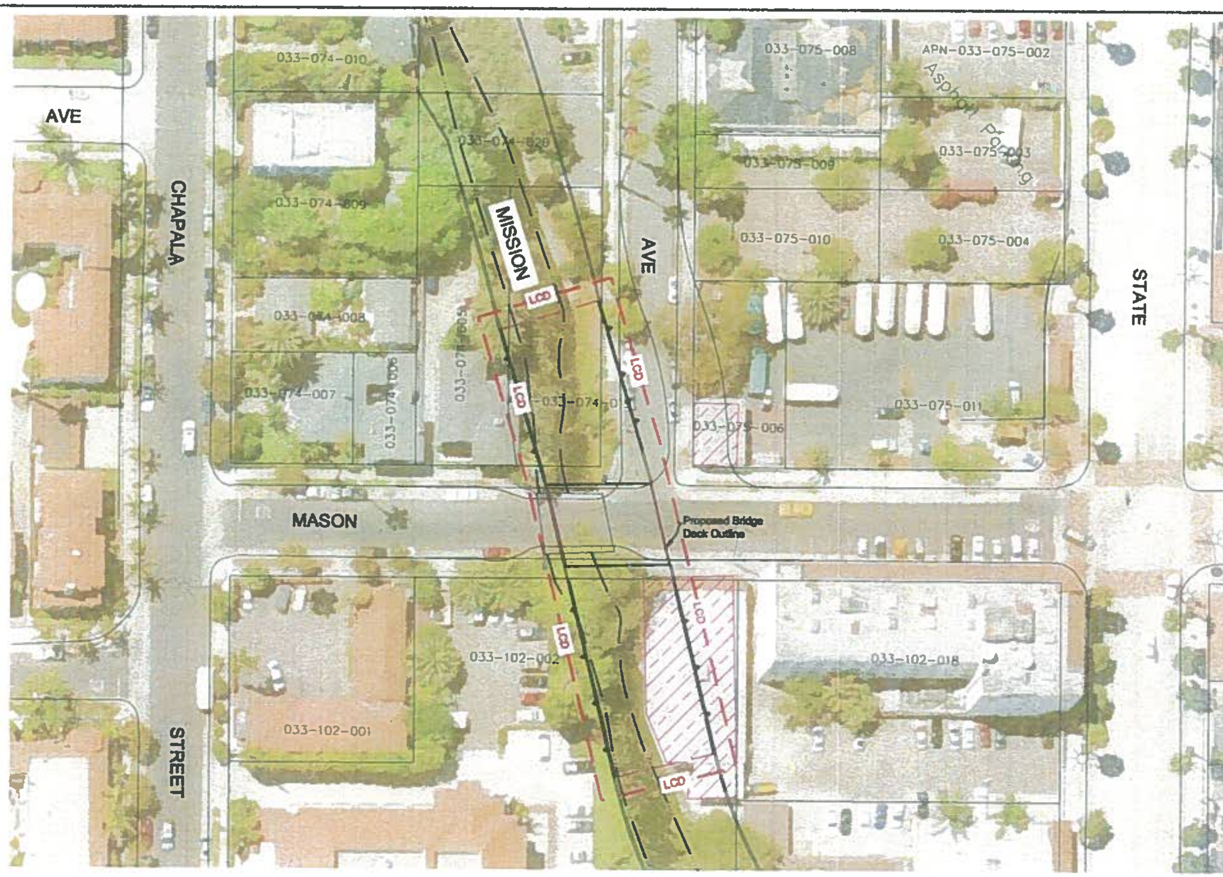


Figure 7 Mason Street Bridge
Limits of Creek Disturbance



NOTES:

1. Kimberly alignment is shown in Concept only. Alignment to be supplied by City.
2. The Lower Mission Creek channel walls are shown, in Concept only, both upstream and downstream of the Mason St. bridge. The channel wall linework is by Others and subject to change.
3. Creek disturbance limits, as shown conceptually, do not include the Dewatering areas.

Reference:

Aerial Photo and Base Mapping provided by the City of Santa Barbara; photography dated Dec. 2004.

Legend

— LCD — = Potential Limits of Creek Disturbance

= Building to be Moved/Demolished (as part of this Project)

033-xxx-xxx = Assessor's Parcel Number

Scale: 1" = 30'

Bengal Engineering, Inc.
Civil, Bridge, Hydraulics, Structural & Highway Engineers

LIMITS OF CREEK DISTURBANCE

MASON STREET BRIDGE REPLACEMENT
BRIDGE NO 51C-0287, BRLO-5007(045), EA05-930144
SANTA BARBARA, CA

Plot Date: June 21, 2010

Figure 8 Mason Street Bridge
Engineering Layout

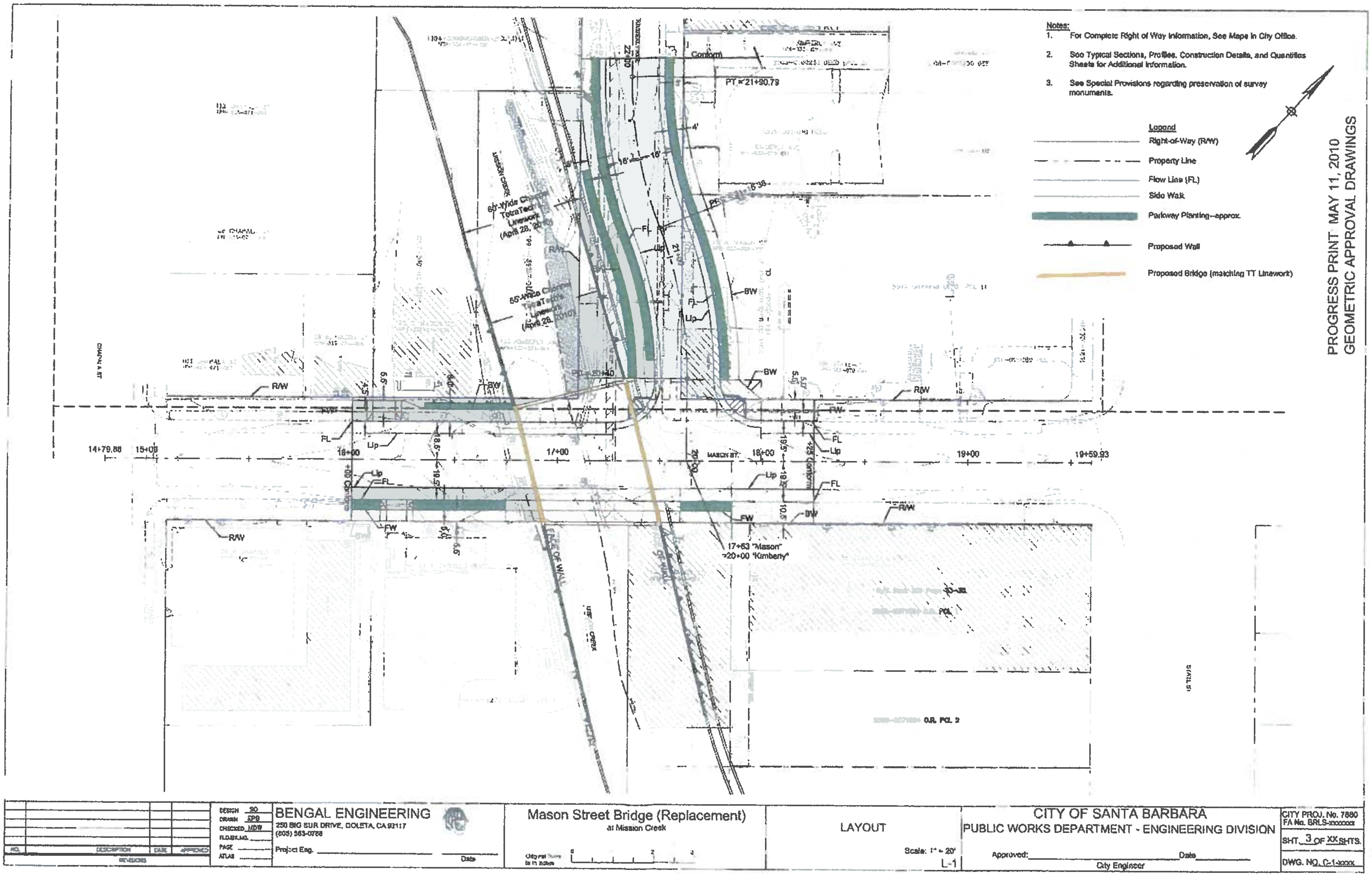


Figure 9 Mason Street Bridge Conceptual Diversion and Dewatering Plan

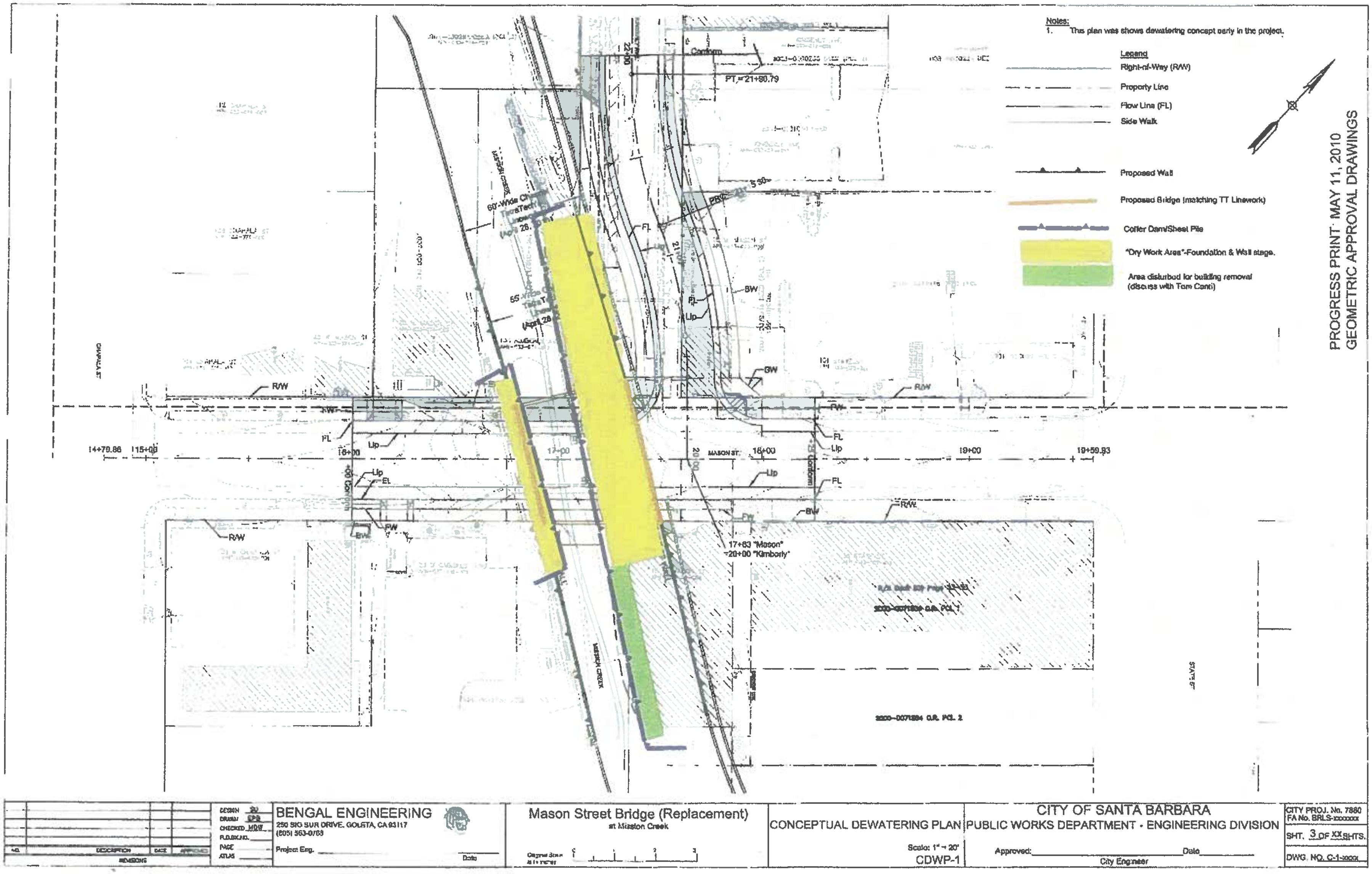


Table 1: Observed Vascular Plant Species at Mission Creek: Chapala, Cota, and Mason Street Bridges

Scientific Name	Common Name	Wetland Indicator Status	Abundance Chapala Street Bridge	Abundance Cota Street Bridge	Abundance Mason Street Bridge
TREES					
Acacia melanoxylon	blackwood acacia				uncommon upstream
Ailanthus altissima	tree of heaven	FACU			
Brachychiton discolor	pink flame tree			occasional street tree on Cota Street	
Eriobotrya japonica	loquat tree		planting near creek		
Ficus carica	edible fig		occasional	uncommon	
Fraxinus uhdei	Shamel ash			uncommon	
Koelruteria bipinnata	Chinese lantern tree		uncommon		uncommon
Lagunaria patersonii	Primrose tree		street tree on Chapala Street		
Lophostemon conferta	Brisbane box		planting near creek		
Phoenix canariensis	Canary Island palm			uncommon	uncommon
Pinus halepensis	Aleppo pine			uncommon	
Pinus pinea	Italian stone pine			uncommon	
Pinus radiata	Monterey pine		planting near creek		uncommon planting
Pittosporum undulatum	Victorian box		uncommon	uncommon	
Platanus racemosa	**western sycamore**	**FACW**	**large individuals near stream**	**dominant along stream**	**large individual on streambank**
Populus nigra 'Italica'	Lombardy poplar			planting on downstream bank	
Quercus agrifolia	**coast live oak**				**uncommon on upstream banks**
Quercus lobata	valley oak				uncommon near parking lot, presumed planting
Salix lasiolepis	**arroyo willow**	**FACW**		**scattered**	
Salix laevigata	**red willow**	**FACW+**		**scarce, seedling**	
Schefflera pueckleri	mallet flower				uncommon
Washingtonia robusta	Mexican fan palm		uncommon	scarce, seedlings	
SHRUBS/SUBSHRUBS					
Agave americana	blue agave			uncommon	
Agave attenuata	swan's neck agave		uncommon	uncommon	occasional
Aloe arborescens	tree aloe		planting		

Table 1: Observed Vascular Plant Species at Mission Creek: Chapala, Cota, and Mason Street Bridges

Scientific Name	Common Name	Wetland Indicator Status	Abundance Chapala Street Bridge	Abundance Cota Street Bridge	Abundance Mason Street Bridge
Baccharis pilularis* subsp. *consanguinea	**coyote bush**				**occasional**
Bougainvillea cultivar	Bougainvillea			occasional	uncommon
Brugmansia cultivar	angel's trumpet				uncommon
Carissa macrocarpa	natal plum				uncommon
Crassula ovata	jade plant				uncommon
Distictis buccinatoria	red trumpet vine		uncommon		
Ligustrum vulgare	common privet		planting		
Nerium oleander	oleander		uncommon		
Opuntia ficus-indica	Mission cactus, tuna			uncommon	
Ricinus communis	castor-bean	FACU		occasional	
Rosa californica	**California wild rose**	**FAC+**			**uncommon, planted?; located in planting area**
Rubus discolor	Himalayan blackberry	FACW	occasional		
Salix sitchensis	Sitka willow	FACW+			uncommon near parking lot, presumed planting
Solanum douglasii	**Douglas' nightshade**	**FAC**		**uncommon**	
Yucca elephantipes	giant yucca		planting		planting
HERBS (ANNUALS, BIENNIALS, HERBACEOUS PERENNIALS)					
Acanthus mollis	bear's breeches				uncommon
Ageratina adenophora	throughwort, eupatory			uncommon	
Anagallis arvensis	scarlet pimpernel	FAC			occasional
Apium graveolens	celery	FACW		uncommon	
Artemisia douglasiana	**mugwort**	**FACW**		**uncommon**	**uncommon**
Arundo donax	giant reed	FACW	common	occasional	
Avena barbata	slender wild oat			uncommon	
Bidens pilosa var. *pilosa*	hairy beggar's ticks	**FACW**		uncommon	uncommon
Bromus catharticus	rescue grass			uncommon	uncommon
Bromus diandrus	ripgut brome			common	scattered
Bromus rubens [madritensis subsp. *rubens]*	red brome			uncommon	uncommon
Centranthus ruber	red valerian				uncommon
Cerastium glomeratum	mouse-eared chickweed	FACU		uncommon	
Chenopodium murale	nettle-leaf goosefoot			uncommon	uncommon
Conium maculatum	poison-hemlock	FACW		uncommon	
Conyza canadensis	horseweed	FAC		occasional	
Cynodon dactylon	Bermuda grass	FAC			occasional
Cyperus eragrostis	**tall flatsedge**	**FACW**	**uncommon**	**uncommon**	
Cyperus involucratus	umbrella sedge	OBL		uncommon	
Dietes iridioides	butterfly iris				occasional

Table 1: Observed Vascular Plant Species at Mission Creek: Chapala, Cota, and Mason Street Bridges

Scientific Name	Common Name	Wetland Indicator Status	Abundance Chapala Street Bridge	Abundance Cota Street Bridge	Abundance Mason Street Bridge
Digitaria sanguinalis	crabgrass		uncommon	uncommon	uncommon
Epilobium ciliatum	**willow-herb**	**FACW**		**uncommon**	
Ehrharta erecta	tall veldt grass		occasional	occasional	
Festuca arundinacea	tall fescue			uncommon	
Foeniculum vulgare	sweet fennel, sweet anise	FACU	occasional	occasional	occasional
Hedera helix	English ivy		scattered	common on downstream side of bridge	common
Helminthotheca echioides	bristly ox-tongue	FAC		uncommon	occasional
Hirschfeldia incana	summer mustard,		occasional	scattered	
Hordeum murinum subsp. *leporinum*	foxtail barley			uncommon	
Hydrocotyle verticillata	**whorled marsh pennywort**	**OBL**		**uncommon**	
Ipomoea indica	blue morning-glory			occasional	
Juncus xiphioides	**iris-leaved rush**	**OBL**	**uncommon**		
Lactuca serriola	prickly lettuce	FAC		uncommon	
Lavatera cretica	Cretan mallow			uncommon	uncommon
Lepidium coronopus	swine cress			uncommon	
Lolium multiflorum	Italian ryegrass			occasional	
Ludwigia peploides	**yellow marsh-primrose**	**OBL**	**occasional**	**scattered**	
Malva parviflora	cheeseweed			uncommon	uncommon
Marrubium vulgare	horehound	FAC		scarce	
Medicago polymorpha	bur-clover			uncommon	uncommon
Melilotus indicus	yellow sweet-clover	FAC	uncommon	uncommon	uncommon
Mentha x piperita	peppermint	OBL		uncommon	
Mirabilis jalapa	four-o'clock			uncommon	
Nasturtium officinale	**watercress**	**OBL**	**occasional**		
Oxalis pes-caprae	Bermuda-buttercup			uncommon	
Paspalum dilatatum	dallisgrass	FAC			uncommon
Parthenocissus quinquinfolia	Virginia creeper			occasional	
Pennisetum clandestinum	kikuyu grass	FACU+		uncommon	occasional
Persicaria punctata	**spotted smartweed, water smartweed**	**OBL**		**occasional**	
Piptatherum miliaceum	smilo		occasional	occasional	occasional
Plantago lanceolata	English plantain	FAC-			uncommon
Plantago major	common plantain	FACW-			uncommon
Poa annua	annual bluegrass	FACW-		uncommon	
Polygonum aviculare subsp. *depressum*	knotweed			uncommon	
Polypogon interruptus [viridis]	ditch beardgrass	OBL		occasional	scattered
Polypogon monspeliensis	rabbitsfoot grass	FACW+	occasional	occasional	
Portulaca oleracea	common purslane	FAC	occasional		
Pseudognaphalium luteoalbum	cudweed aster	FACW-		uncommon	

Table 1: Observed Vascular Plant Species at Mission Creek: Chapala, Cota, and Mason Street Bridges

Scientific Name	Common Name	Wetland Indicator Status	Abundance Chapala Street Bridge	Abundance Cota Street Bridge	Abundance Mason Street Bridge
Raphanus sativus	wild radish				uncommon
Rumex conglomeratus	green dock	FACW		uncommon	uncommon
Rumex crispus	curly dock	FACW-		uncommon	
Senecio vulgaris	common groundsel			uncommon	
Sonchus oleraceus	common sow-thistle			occasional	occasional
Tropaeolum majus	garden nasturtium			common on eastern bank upstream from bridge	uncommon
Typha angustifolia	**narrow-leaved cattail**	**OBL**		**uncommon**	
Typha latifolia	**common cattail**	**OBL**	**uncommon**	**occasional**	
Veronica anagallis-aquatica	water speedwell	OBL		uncommon	
Vicia sativa	common vetch	FACU			uncommon
Vinca major	periwinkle			occasional	uncommon
Vulpia [Festuca] myuros	rattail fescue	FACU*		uncommon	
Xanthium strumarium	**cocklebur**	**FAC+**	**uncommon**	**uncommon**	
FERNS AND FERN ALLIES					
Equisetum arvense	**common horsetail**	**OBL**	**occasional**	**scattered**	

Notes:

Native species are in **bold** print
Based on 2010 ARCADIS surveys of proposed disturbance areas
Uncommon = rarely observed on Site, not found in high numbers in given community; Occasional = occasionally found in given community on Site, but not consistently distributed; Scattered = found in varying numbers in some but not most areas within in given community; Common = consistently or often present in given community on Site.

Table 2: Present or CNDDB Recorded Sensitive Elements of Biological Diversity for Site and Surrounding Areas
Mission Creek, Santa Barbara, California

Based on CNPS Inventory of Rare and Endangered Plants (online edition, v7-09c; 2010) and CNDDB (2010) search results for the Santa Barbara quadrangle in which Site occurs, as well as surrounding quadrangles: Carpinteria, Goleta, Hildreth Peak, Little Pine Mountain, and San Marcos Pass.

Sensitive Species		Status (USFWS/CDFG/CNPS)	Habitat	Occurrence of Element on Project Site
Name	Common Name			
Amphibians				
Bufo californicus	Arroyo toad	FE / -	Riparian, river and stream courses and adjacent areas	Not observed; limited and poor quality habitat present for this species.
Rana draytonii	California red-legged frog	FT / CSC	Ponds, streams, aquatic systems	Not observed; limited and poor quality habitat present for this species
Birds				
Accipiter cooperii	Cooper's hawk	- / CSC	Oak woodland/ may utilize many habitat types	Not observed, suitable habitat present in surrounding area.
Buteo regalis	Ferruginous hawk	- / -	Open grasslands, fields, hillsides, agricultural areas	Not observed, no suitable habitat present
Charadrius alexandrinus nivosus	Western snowy plover	FT / CSC	sandy beach areas and estuaries	Not observed, no suitable habitat present
Elanus leucurus	White-tailed kite	fully protected / -	grassland, coastal scrub, oak woodlands	Not observed, no suitable habitat present
Empidonax traillii extimus	southwestern willow flycatcher	FE / SE	Willow riparian and riparian systems	Not observed, limited habitat of poor to marginal suitability present.
Gymnogyps californicus	California condor	FE / SE	Open areas of many habitat types	Not observed, no suitable habitat present
Passerculus sandwichensis beldingi	Belding's savannah sparrow	- / SE	coastal salt marshes	Not observed, no suitable habitat present
Rallus longirostris livipes	Light-footed clapper rail	FE / SE	coastal salt marshes	Not observed, no suitable habitat present
Riparia riparia	Bank swallow	- / ST	Primarily riparian habitats with exposed sandy vertical banks or cliffs	Not observed, no suitable habitat present
Vireo bellii pusillus	Least Bell's vireo	FE / SE	Willow riparian and riparian systems	Not observed, limited habitat of poor to marginal suitability present.
Fish				
Eucyclogobius newberryi	Tidewater goby	FE/CSC	Persistent, shallow, still-to-slow-moving, aquatic habitat most commonly ranging in salinity from 0.5 ppt to about 10 to 12 ppt	Not observed, suitable habitat present
Oncorhynchus mykiss	Southern steelhead	FE/CSC	Coastal streams, creeks and rivers	Not observed, suitable habitat present
Reptiles				
Actinemys marmorata pallida	Southwestern pond turtle	FSC / CSC	Ponds, lakes, streams	Not observed; marginally suitable freshwater aquatic habitat present
Plants				
Astragalus pycnostachyus var. *lanosissimus*	Ventura marsh milk vetch	FE / CE / 1B.1	Coastal dunes, coastal scrub, coastal marshes and swamps	Not observed; suitable habitat absent. Regional endemic. Currently restricted in the wild to Ventura County; extirpated in Los Angeles and Orange Counties; planted in Santa Barbara County.

Table 2: Present or CNDDB Recorded Sensitive Elements of Biological Diversity for Site and Surrounding Areas
Mission Creek, Santa Barbara, California

Sensitive Species		Status (USFWS/CDFG/CNPS)	Habitat	Occurrence of Element on Project Site
Name	Common Name			
Cordylanthus maritimus subsp. *maritimus*	Salt marsh birds beak	FE / CE / 1B.2	Coastal dunes, coastal salt marsh	Not observed; potential suitable habitat absent. Not reported from Santa Barbara quadrangle in CNDDB (2010) but known from Carpinteria salt marsh.
Lasthenia conjugens	Contra Costa goldfields	FE / - / 1B.1	Vernal pools, associated grassland and woodlands, margins of estuarine marshy areas	Not observed; suitable vernal pools absent. Not reported in Santa Barbara quadrangle in CNDDB (2010), but reported from Goleta area.
Lasthenia glabrata subsp. *coulteri*	Coulter's goldfields	SOC / - / 1B.1	Estuary margins, associated grassland and playa areas.	Not observed; potential suitable habitat present. Not reported from Santa Barbara quadrangle in CNDDB (2010) but known from Goleta.
Nasturtium gambelii	Gambel's water cress	FE / - / 1B.1	Marshes and swamps	Not observed; potential suitable marsh habitat present. Type locality "near city of Santa Barbara" in 1876; not reported in Santa Barbara since.

CNDDB Element Ranking System:

G = Global, S = State

1 - less than 6 viable element occurrences OR less than 1,000 individuals, or < 810 hectares (2,000 acres)
2 - 6 to 20 element occurrences OR 810 to 4,050 hectares (2,000 to 10,000 acres)
3 - 21 to 100 element occurrences OR 4,050 to 20,235 hectares (10,000 to 50,000 acres)
4 - apparently secure, but factors exist to cause some concern (i.e. there is some threat or somewhat narrow habitat)

Extensions to Ranking Categories

.1 - very threatened
.2 - threatened
.3 - no current threats known

Status Codes

United States Fish and Wildlife Service (USFWS)

FE Federal Endangered
FT Federal Threatened
FC Federal Candidate
SOC Species of Concern as listed by Sacramento Office (USFWS, 2004)
MNBMC Migratory nongame bird of management concern
FSC Federal special concern species

California Department of Fish and Game (CDFG)

CE California Endangered
CT California Threatened
CR California Rare
CSC California Species of Concern

California Native Plant Society (CNPS)

Lists

List 1B: Plants Rare, Threatened, or Endangered in California and Elsewhere
List 2: Plants Rare, Threatened, or Endangered in California, But More Common Elsewhere
List 3: Plants About Which We Need More Information - A Review List

Extensions to List Categories

1 - Seriously endangered in California (over 80% of occurrences threatened / high degree and immediacy of threat)
.2 – Fairly endangered in California (20-80% occurrences threatened)
.3 – Not very endangered in California (<20% of occurrences threatened or no current threats known)

Chapala Street Bridge site, looking upstream at sandy substrate and occasional native freshwater marsh species.

7/8/2010

P7080543

Chapala Street Bridge site, looking downstream. One native western sycamore is visible in this photograph (red arrow) along with dense stands of the invasive giant reed (blue arrow).

6/16/2010

P6160478

Cota Street Bridge site, looking downstream towards bridge. This site supports a small fragment of mixed riparian forest dominated by western sycamore and arroyo willow along the margins, and freshwater marsh vegetation in the streambed.

7/8/2010

P7080525

Cota Street Bridge site, looking upstream from annual grassland on west bank. This site supports mixed riparian forest dominated by western sycamore and arroyo willow along the margins, and freshwater marsh vegetation in the streambed.

6/16/2010

P6160438

Cota Street Bridge site. Yellow marsh-primrose is one of several native freshwater marsh species growing at this site.

7/8/2010

P7080501

Cota Street Bridge site, looking downstream. Invasive English ivy on right and tree of heaven on left predominate, along with patches of native freshwater marsh species, such as the cattail in the foreground.

7/8/2010

P7080511

Mason Street Bridge site, looking downstream towards bridge. Invasive English ivy grows over walls on right and a combination of non-native, native, and planted species occur on banks on left.

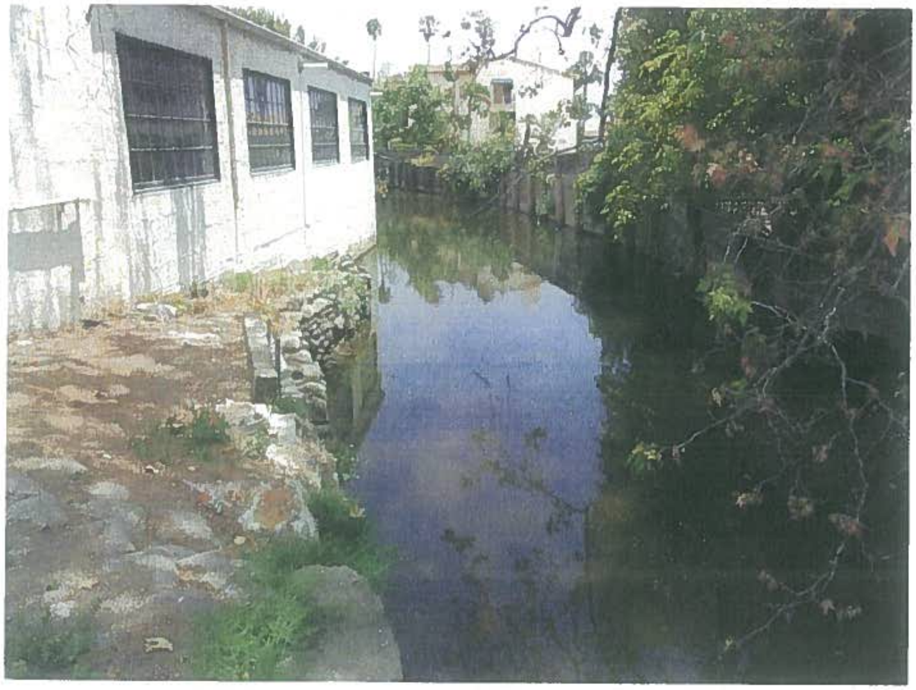
7/8/2010

P7080580

Mason Street Bridge site, looking upstream from bridge. Native coyote bush (red arrow) and oak trees (blue arrow) are visible in this photograph.

7/8/2010

P7080569



Mason Street Bridge site, looking downstream from bridge.

7/8/2010

P7080460

Mason Street Bridge site. A large multi-trunked western sycamore leans over the water immediately downstream from the bridge.

7/8/2010

P7080461

Chapala Street Bridge Replacement Project Description

INTRODUCTION

The City of Santa Barbara has initiated this project to replace the Chapala Street Bridge over Mission Creek utilizing funds from the federal-aid Highway Bridge Program administered by the Federal Highway Administration (FHWA) through Caltrans Local Assistance. The bridge would be replaced with a new bridge that meets current applicable City, American Association of State Highway and Transportation Officials (AASHTO) and Caltrans design standards. The new bridge would be placed at the same location as the existing bridge and would utilize the existing street alignments.

EXISTING CONDITIONS

The bridge is currently posted for a 15-ton load limit and is rated Structurally Deficient according to FHWA bridge rating standards. The existing Chapala Street Bridge is a simple-span timber floor-beam bridge on a 66-degree skew, supported on masonry stone abutments built in 1920. The floor beams are 30.5' long supported on the sandstone channel walls. Due to the high skew angle to the creek, the triangular end spans are supported by riveted steel pony trusses approximately 80-feet long. The deck width, on Chapala Street, between the trusses, is approximately 58-feet wide. The existing bridge deck has no sidewalks; pedestrians currently walk on the bridge deck on each side of Chapala Street. Chapala Street is closed with chain link fencing at the north end of the existing bridge to keep vehicular traffic off of the very short section of Chapala Street between Yanonali Street and the Union Pacific Railroad tracks.

The existing bridge was rehabilitated in 1975-1976. The rehabilitation involved a complete removal of the original redwood deck/stringer system and replacement with creosote coated Douglas fir floor beams and deck planks, with a new AC overlay. Subsequent to the reconstruction project in late 1976, the original pony trusses were significantly modified from their original condition by the addition of a rolled channel section covering the entire outer chords of the truss, shielding the original riveted double angle chords from view. The rolled steel channel is connected to the original riveted truss using high strength bolts.

In the vicinity of the Chapala Street Bridge, Mission Creek is contained in a concrete lined channel with vertical stacked sandstone walls at three corners of the bridge and a near vertical sacked concrete wall at the northeast side downstream of the bridge. The channel is approximately 28-feet wide and 10-feet deep at the bridge.

REPLACEMENT BRIDGE DESCRIPTION

The replacement bridge would be a single span bridge consisting of a combination of pre-cast and cast-in-place concrete slab with asphalt concrete or polyester concrete overlay on the deck for the road surfacing. The new bridge roadway width on Chapala Street would match the existing bridge width. City standard sidewalks would be added to both sides of the street on the bridge and would tie in to the existing sidewalks along Chapala Street and Yanonali Street. New combination vehicular/pedestrian railings would be installed on each side of the bridge over Mission Creek.

The Santa Barbara County Flood Control District and the U.S. Army Corps of Engineers are planning to construct the Lower Mission Creek Flood Control Project at about the same time as the Chapala Street Bridge replacement project. The flood control project, currently under design, would involve placing a box culvert immediately adjacent to the north abutment of the Chapala Street Bridge. Because of the very close proximity of the bridge to the planned culvert, the design of the bridge would need to accommodate the culvert.

The existing stacked sandstone channel walls under the Chapala Street Bridge are of local historic interest, so if it is possible to leave them intact, the Chapala Street Bridge replacement project would be designed to avoid impacts to the channel walls. The final alignment of the flood control box culvert would determine whether it is possible to leave the existing channel walls intact. The Santa Barbara County Flood Control District, USACOE and the City of Santa Barbara are working together to balance the hydraulic requirements of the flood control project, private property building demolition, and preservation of the channel walls.

The proposed approach would provide more room for the flood control box culvert alignment by removing and replacing the existing north channel wall. The existing sandstone channel wall under the north end of the bridge would be removed and replaced with the face of the new bridge abutment. The exposed surface of the new wall would be constructed with a form liner and colored concrete similar to other bridge replacement projects on Lower Mission Creek. The new abutment on the south side of the channel would be constructed to avoid impacts to the southerly existing channel wall as in the first alternative.

REPLACEMENT ROADWAY DESCRIPTION

The new bridge deck surface would be slightly higher (<0.5') than the existing bridge deck, requiring minor approach roadway grading to conform back to the existing roadway surfaces. The roadway construction would conform back to the existing roadway within 75-feet of the end of the bridge in any direction. There would be no changes made to existing drainage patterns. Private property hardscape and landscape would be removed and replaced immediately adjacent to the corners of the bridge.

The new bridge deck may be replaced in a similar configuration to that already existing, or the new deck may exclude that portion of the bridge that is supported by the triangular end span on the railroad side of the bridge.

Overhead electrical utility poles would be relocated to avoid conflicts with the new bridge foundations. Underground utilities would be either relocated off the bridge or incorporated into the new bridge.

CONSTRUCTION ACTIVITIES

Chapala Street would be closed to traffic during the construction of the replacement bridge. The existing bridge would be removed, and the new bridge constructed to completely span the existing channel at the same location as the existing bridge. The construction activities would proceed in the following sequence:

1. Close Chapala Street at Yanonali Street. Traffic to be routed onto west Yanonali south of the bridge and access north of the bridge to be from Kimberly Avenue. There is no ground disturbing activity associated with the establishment of the detour. Work would involve erection of barricades and signs placed on barricades and existing poles in the vicinity of the project. Equipment would be a boom truck.
2. The overhead utility poles to be relocated within the project limits. There are two utility poles in the project limits to move to new locations. Equipment used would be truck mounted drilling equipment, truck mounted cranes and associated overhead electrical, telephone and cable TV installation equipment.
3. Divert stream flow into pipe through construction zone. A stream diversion to be established in conformance with City and County specifications, and regulations as required by the California Department of Fish and Game, US Fish and Wildlife Service and the National Marine Fisheries Service. The stream diversion would be constructed within the concrete lined channel within the project limits to divert the flow of water around the demolition and construction activities. Materials to construct the diversion would consist of pipe or pipes as needed to convey anticipated flow rates, sandbags and plastic sheeting to construct a diversion dam on

the concrete lined channel upstream of the site and within the project limits. The downstream side of the diversion drops off the concrete lined channel into the natural channel, so any water trapped downstream of the diversion dam would drain by gravity flow into the natural channel, leaving the work area dry. Equipment used would be light truck mounted cranes above the channel and laborers within the concrete lined channel.

4. The existing bridge to be demolished and disposed of offsite. The existing bridge would be demolished by first stripping the AC overlay and deck planks off of the timber stringers. The channel below would be protected with the stream diversion and plastic or fabric sheets to contain debris that falls through the timber stringers. The timber stringers would be removed with truck mounted cranes. Finally, the trusses would be removed by chipping away the concrete at the top of the channel walls where the truss chords are embedded in the wall. The existing bridge bearings would be cut away from the walls and all material from the existing bridge would be hauled off site for disposal. The existing bridge would be tested for hazardous materials prior to construction and the bridge would be dismantled and disposed of in proper landfill facilities based on the finding of the hazardous materials study. If the existing trusses are salvaged for reuse on the project as non-structural landscaping elements, the trusses would be taken offsite for removal of any hazardous materials such as lead based paint. The equipment used for demolition would be backhoes, loaders, dump trucks, debris bins, flatbed trucks with cranes, air compressors, jackhammers, chipping guns, cutting torches and saws.
5. Remove portions of hardscape and landscaping in conflict with new construction. The areas around the corners of the new bridge would be cleared of vegetation, fencing and planter beds to gain access for constructing the new bridge. The work would be within the project limits. Equipment used would be backhoes, loaders, dump trucks, debris bins, flatbed trucks with cranes, air compressors, jackhammers, chipping guns, cutting torches and saws.
6. Sawcut pavement to limits shown on plans and remove existing pavement and sidewalks for disposal offsite. The existing pavement would be saw cut and removed as shown on the plans. Materials removed would be hauled to offsite disposal facilities. Equipment used would be concrete saws, backhoes, loaders, dump trucks jack hammers and air compressors.
7. The existing waterline under the bridge would be removed and disposed of offsite. The waterline valve south of the bridge would be relocated farther south and a short segment of water pipe would be relocated south of the bridge within the project limits. The work would require excavation in the street under traffic control to expose the existing water line and temporary pavement patching on the south side of the bridge on Chapala Street. Equipment used would be excavators, backhoes, trench shoring, boom truck, dump trucks, concrete trucks, trench compaction equipment, and pavement compactor.
8. The existing telecommunication conduits under the bridge would be relocated to temporary locations adjacent to the bridge within the project limits. Equipment used would be backhoes, loaders, boom truck.
9. For alternative one the channel walls would be repaired/modified at the top of wall where the existing bridge was supported. The top of the existing sandstone wall would be cleaned up and repaired as needed. Access to the top of wall would be from above and from inside the concrete lined channel. Equipment used would be air compressors, jack hammers, chipping guns, concrete trucks, concrete mixers, boom trucks, saws, and cutting torches.

   For Alternative two that would result in the removal of the existing north sandstone wall, it would be sawcut vertically at the edge of the new abutments. A row of temporary piling would be installed approximately 5-feet behind the sandstone walls as temporary shoring. The existing sandstone walls between the saw cuts would be completely removed, estimated to be approximately four feet below the flow line of the concrete channel bottom. The concrete channel bottom within ten feet of the new wall would be removed. Groundwater would be encountered below the channel bottom, so dewatering would be needed within the excavations. The groundwater would be pumped through appropriate settling tanks and filters and released into the creek downstream of the construction site. Concrete would be poured into areas that have been dewatered. Equipment used would be cranes with vibratory hammers, concrete saws, excavators, excavators with hoe-rams, jackhammers, chipping guns, air compressors, dump trucks and boom trucks.

10. For alternative one excavate behind existing walls for the new abutments. Excavate 11-foot wide trench 8-feet deep behind the channel wall for the new abutments. The equipment used would be backhoes, shoring, and dump trucks. Material to be disposed of offsite. Groundwater is below depth of excavation, so dewatering would not needed.
11. Excavate and relocate drainage inlet/pipe at northwest corner of bridge. The drainage inlet would be tied into the existing drainage pipe that penetrates the channel wall at the northwest corner of the bridge. Equipment used would be backhoe, boom truck, trench shoring, and compaction equipment.
12. For alternative one drive steel pile casings behind existing channel walls. 36-inch steel pipe piles would be driven approximately 60-feet into the ground in excavations behind channel walls. Equipment used would be a track mounted crane with pile driving leads, diesel pile driving impact hammer, drilling equipment, loaders, dump trucks and cutting torches. For alternative two, similar construction as alternative one on the south side, but steel H-piles would be driven into the dewatered excavation on the north side.
13. For alternative one remove soil from inside steel piles and place reinforced concrete into steel piles. Equipment used would be large drilling truck, loaders, dump trucks, cranes, concrete trucks, and air compressors. Piles would be sealed against groundwater intrusion, so dewatering is not anticipated. However, in the event that seepage into the piles does occur, dewatering of the piles prior to placement of concrete would be needed. Assuming that the piles fill with water, there would be a maximum of 10,000 gallons of water pumped from the piles. Specifications would be written to require the contractor to pump the water from the piles into a containment tank and remove the water from the site for proper disposal off site.
14. For alternative one (both abutments) and the southern abutment of alternative two, form and place concrete for abutments, finish and backfill behind. For the northern abutment for alternative two form and place concrete for abutment, finish and backfill behind and in front of abutments. For the northern abutment for alternative two place concrete channel bottom to the face of the new abutment. Equipment used would be boom trucks, dump trucks, concrete trucks, air compressors, chipping guns and compaction equipment.
15. Erect bridge falsework supported on concrete channel bottom. Falsework would be supported from the concrete channel bottom. Equipment used would be truck mounted crane, forklift, flatbed trucks, saws, cutting torches and air compressors. Work within channel would be laborers placing falsework delivered by cranes from the creek bank above.
16. Form and place concrete for new bridge. Formwork would be built on the falsework, and then reinforcement and concrete would be placed in the forms.
17. Form and place concrete for bridge barrier railing and sidewalk. Equipment used would be boom trucks, forklifts, concrete trucks and air compressors.
18. Remove falsework from channel and finish concrete surfaces. The formwork would be stripped from the bridge, the falsework released and removed from the channel. The bridge concrete surfaces would be ground and patched as needed to produce an acceptable finished surface. Equipment used would be truck mounted cranes,

forklifts, flatbed trucks, air compressors, scaffolding, and hand held grinders. Upon completion of concrete finishing, channel would be cleaned of debris within the streambed diversion area.

19. Remove stream diversion from channel. The temporary dam, pipe, sandbags and plastic sheeting would be removed from the channel. Equipment used would be boom truck and forklift.
20. Backfill behind abutments and place roadway base materials. The roadway would be prepared for final surfacing. Equipment used would be loaders, dump trucks, and compaction equipment.
21. Relocate underground utilities into final position on new bridge. Equipment used would be backhoe and compaction equipment.
22. Place new pavement and sidewalks. Equipment used would be dump trucks, concrete trucks, compaction equipment, and air compressors.
23. Replace hardscape and landscape. Finish work on areas with the temporary construction easements. Equipment used would be loaders, backhoes, trenchers, concrete trucks, forklifts, and air compressors.

For alternative one, ground disturbance in the project area would be confined to excavations in the existing paved roadway and sidewalk areas, and within the limited temporary construction easements on landscaped private properties adjacent to each corner of the bridge. The concrete lined channel would have no excavations, but the concrete surfacing would support the diversion dam and pipe(s), falsework pads and laborers within the project limits. For alternative two, ground disturbance is similar to alternative one, except that the north channel wall would be removed with an excavation for the new abutment seven feet wide and four feet below the channel bottom, dewatered as described above.

The project would require the removal of two trees of greater than 6-inch trunk diameter as shown on the preliminary project plan.

Adequate contractor lay down and staging areas are available with the portions of Chapala Street and Yanonali Street that would be closed during construction.

RIGHT-OF-WAY

No acquisition of permanent right-of-way is anticipated for this project, as all improvements would occur within the City's existing right-of-way.

Temporary construction easements would be acquired prior to construction for several properties at each corner of the existing bridge.

The park at the northeast corner of Chapala and Yanonali Street would be designated on the plans as an environmentally sensitive area and would be fenced off to prevent the contractor from entering the park property. The existing "Porter Bridge" just upstream of the project and adjacent to the northwest corner of the Chapala Street Bridge would be designated as an Environmentally Sensitive Area to be protected in-place with no disturbance from this project.

UTILITIES

There is a 12-inch water line on the bridge that would be removed and capped on each side of the bridge.

There is a bank of three 4-inch communication conduits suspended under the existing bridge. These conduits would be rerouted though the new bridge.

Two poles supporting overhead electrical and telecommunication lines would be relocated due to conflicts with the new bridge. Temporary de-energizing of these lines would be required during certain construction operations.

Cota Street Bridge Replacement Project Description

Introduction

The City of Santa Barbara (City), in cooperation with the California Department of Transportation (Caltrans) and the Federal Highway Administration (FHWA), proposes to replace the Cota Street Bridge over Mission Creek (Bridge No. 51C-0246) in the city of Santa Barbara, Santa Barbara County, California.

Project Location

The proposed project is located on Cota Street, between Bath Street and De La Vina Street. The area of construction is a part of the Lower Mission Creek Flood Control (LMCFC) project currently under design by the Army Corps of Engineers. The bridge spans Mission Creek.

Project Setting

Mission Creek is not considered a perennial stream. During most summers the streambed is dry. Mission Creek is subject to flooding in "wet years". This flooding is the driving force of the LMCFC project. This project is not a "cure-all" to the Mission Creek flooding problem, because the Corps has determined that is not economically feasible to accommodate large flows, such as a 100-year-event. Since funding is limited, the channel would be designed to accommodate 3,400 cubic feet per second (cfs); the proposed bridge conveyance would match this capacity.

The existing land use is urban/residential. The neighborhood is generally comprised of small, older homes. Housing is relatively dense. Many have been converted to rental properties. Some of the buildings have "additions", enlarging the original footprint. Several buildings (or portions thereof) crowd the bridge and creek corridor and would eventually be removed as part of the LMCFC project channel widening.

The population density and lack of on-site parking has resulted in high on-street parking demand. The neighborhood is within walking distance to downtown Santa Barbara, so on-street parking demand is heavy during the day.

Mature street trees and vegetation, in the parkways, separate the roadway from the sidewalks. The street has wide concrete gutters and concrete curbs. The bridge sidewalks are spacious, giving the bridge a unique feel in an otherwise busy environment. The space upstream of Cota Street bridge includes a dirt access ramp near Bath Street (usually covered with tall grasses) for maintenance in the stream channel. The upstream area also has trees of various types and does not have the extensive channel lining which exists downstream of the bridge.

The bridge carries vehicular, bicycle, and pedestrian traffic. Currently the bridge is more heavily used than is usually the case, as it provides a detour route, especially for traffic heading for Highway 101, while the Haley/De La Vina Street Bridge is under construction. Both Haley Street and De La Vina Street are currently closed to accommodate that project.

The bridge supports existing underground utilities including at least water, communications, and gas lines.

Purpose and Need

The City of Santa Barbara proposes to replace the existing bridge for the following key reasons:

- The existing bridge is "too short" to accommodate the channel capacity of the LMCFC project. The existing bridge (measured perpendicular to the face of the abutments) is about 25-feet-wide at the channel elevation. The new channel would be widened to 37-to 42- feet-wide to accommodate the adjacent LMCFC channel widening project. See sheet 3 of the attached project plans.

- The existing bridge is "structurally deficient". It does not meet the current Code for bridge construction—and cannot be feasibly retrofit. It has served its useful life and should be reconstructed to accommodate modern loads and design criteria.

Existing Bridge

The existing bridge is two-lanes-wide. The existing curb-to-curb width is about 36 feet. The overall width between the bridge rails is about 57 feet (60 feet-outside the bridge rails). The bridge has a skew of about 55-degrees. The bridge has sidewalks roughly 9-feet-wide, on either side. Outside of the bridge footprint, parkways about 6-feet wide separate the street from sidewalks. The right-of-way is 60-feet-wide. Parking is currently allowed on both sides of the roadway.

The existing bridge is not the first bridge be constructed on the existing sandstone bridge abutments. The floods of 1913-14 damaged a previous bridge at Cota Street. A replacement bridge was designed in 1915 (City drawing C-3-11). Evidently this bridge was not built. The 1926 plans have a hand-written note stating, "This plan [1926] revised from [the previous plan of 1915]."

The existing bridge rail does not have the date stamp "1915" embossed in the outside of the bridge rail, as shown on the 1915 plans. Instead, the existing bridge rail matches the appearance of the 1926 design (drawing C-3-110).

Evidently, the City was able to postpone the repair of the 1913-14 damage until 1926, when the superstructure that exists today, was built on top of the old abutments. The existing span is 27-feet, measured perpendicular to the abutments at soffit height.

The bridge is closely flanked by buildings on 3 of 4 corners (the upstream corner near Bath Street is the exception). Vegetation, including invasive specials such as Arundo (Giant Reed) and ivy, exist in the channel. The downstream channel has been "armored" with sacked-concrete, perhaps to protect the nearby buildings. These walls are difficult to see because they are screened by vegetation, but do not appear to be well constructed, especially on the west side, downstream.

The bridge currently carries utility pipes that appear to include water, natural gas, and communications (telephone, TV, perhaps others). There are also overhead utility lines above the bridge, on both sides.

Drainage infrastructure, such as drop inlets and storm drains, is currently limited in the area. One drop inlet, shown on the 1926 plans, exists on the downstream side between the bridge and the Bath Street curb return.

Project Construction Components

Basic Bridge Information

A new bridge would be built at this location to match the channel width required for the LMCFC project. The overall width of the replacement bridge (measured perpendicular to the centerline of the roadway) would remain unchanged at 60-feet-wide. See sheet 3 of the attached project plans.

The roadway geometry would be unchanged as it appears that the general components of the roadway corridor meet the current Code, with the exception of access ramps at the curb returns of Bath and Cota streets.

The replacement bridge superstructure would be built of reinforced concrete, designed in accordance with current codes, but matching the appearance of the existing structure. No change in width or alignment is proposed. The bridge would have a PC/PS (pre-cast/pre-stressed) reinforced concrete bridge deck which is approximately two feet (2') thick.

The new bridge railing would match the look of the 1926 rails. The replacement bridge rails would be at least 43-inches high to meet the current Code.

Bridge Foundation
Replacement of the bridge would require a stream diversion to control surface water, and dewatering of groundwater for the foundation construction. The foundation for the bridge is anticipated to be piles (cast-in-steel shell), supporting a reinforced concrete pile cap, which would in turn support the bridge abutments, which then support the bridge deck above.

The abutment walls could be constructed to match the look of the existing sandstone abutments (using form liner and colored concrete).

Bridge Transition Walls
The channel adjacent to the bridge would be widened to accommodate the future LMCFC project. The bridge would "transition" to the creek walls via "transition walls". We anticipated the that the transition walls would be on the order of 50-feet in length on

three of the 4 corners, with the remaining corner, the upstream corner nearest the intersection of Bath Street and Cota Street, being shorter—perhaps 25-feet in length.

The new transition walls would mimic the original sandstone walls and would be in service until the overall LMCFC project is constructed in the immediate vicinity adjacent to the bridge.

Sidewalk

Sidewalk, and curb and gutter, would be replaced on either end of the bridge in order to replace the bridge. See sheet 2 of the attached project plans.

Construction Easements

Temporary construction easements would be acquired prior to construction for properties within the area of impact. These easements would provide access to work areas and/or to encompass areas within the creek banks which are proposed for improvements. As the project develops the properties will be identified and pursued for fair compensation for its use. Temporary easements may be required for relocation of the overhead utility lines.

Right-of-Way Acquisitions

Permanent right-of-way acquisition would be required to accommodate the proposed improvements, especially for the transition walls. This right-of-way may be acquired as part of the LMCFC project. The areas of right-of-way acquisition for the LMCFC project are currently under development.

Landscaping

Native landscaping would be part of the LMCFC project, as detailed in the in the LMCFC project EIS/EIR. The bridge replacement project does not include substantial landscaping in the channel, as that work is included in the LMCFC project. Minor landscaping improvements would occur in the street corridor, such as the removal of ivy on the south side of Cota Street, near Bath Street, and maintenance to the street trees. Designers for the bridge replacement hope to preserve the street trees on Cota. The impact to the street trees would be identified in the detailed design.

Construction Sequence/Schedule

Proposed project construction would take approximately 18 months to complete. The project construction time could be longer depending on factors such as environmental restrictions, and right-of-way negotiations.

Approximate sequence—and duration-- of the major work tasks would include:

Close Roads/Create Detour: --1 month

Roads would be closed at the following locations:

- Cota Street at Bath St.
- Cota at the private driveways on the east side of bridge.

Demolition of Building(s) —1 month

- 536 Bath (037-161-001)

- 221 W. Cota (037-161-002)
- 230 W. Cota (037-121-018)

Prune Trees: Possible tree removal to allow safe access to work and protect work for falling trees. Concurrent with building demolition.

Relocate Overhead Utilities to clear area for construction. —1 month

Temporary relocation of underground utilities if necessary; --1 month
- Relocate natural gas, water, and the communication lines.

Bridge Demolition: --1 Month
- Remove existing bridge deck
- Construct stream diversion for foundation construction
- Construct shoring system
- Remove existing abutments, interfering portions of existing stream transition walls, and existing bridge foundation

Foundation Construction --5 months
- Construct piles for bridge and transition walls
- Construct pile caps
- Construct abutments

Construct Bridge Superstructure -- 4 Months
- Construct portions of bridge deck
- Relocate utilities to new bridge
- Complete bridge superstructure
- Remove stream diversion
- Construct bridge rails

Construct approach roadways: curb, gutter, sidewalk, drainage,--2 months (starts concurrently with bridge)

Landscaping-- --1 Month

Final clean up/Demobilization. --1 Month

Times represent rough estimate using the limited information available at this time. These times do not include a "break for winter". Construction may take place over 2 construction seasons as the project may be forced to "close down for the winter" due to environmental regulations.

Traffic Control
Because of the limited work space, portions of the local streets would be closed. Traffic detours would be signed and posted to make the traveling public aware of such closures. The closure would be coordinated with local neighbors and the public to allow access.

Construction Staging Area

Lay down would occur in the portions of the roads that would be closed to traffic. Additional lay down areas are desirable. One location that is especially desirable is the upstream parcel at 230 W. Cota St. (APN# 037-121-018).

Resource Protection Measures

The project corridor has been studied extensively in the LMCFC project EIR/EIS. This report details the impacts and protection measures that are required to be implemented in order to protect these valuable local resources. Below is a summary of principal biological, water quality, and construction measures aimed at protecting the natural resources in the area. The project would include all applicable mitigation measures from the LMCFC project EIS/EIR.

Construction in Creek/Diversion/Dewatering

To avoid impact to steelhead trout, which are federally listed species, construction shall be restricted to dates between June I and December 1st if water flow in the CALTRANS Channel [upstream of Yanonali Street within Mission Creek] is more than 1/2 inch deep. If no continuous surface water flow (defined as more than ½" for April and May and more than 1" from June through November) exists in the CALTRANS Channel after April 15th, construction could occur from then until December 1st. The following measures would be a part of the project for any construction in the creek bed:

- No construction, except of a diversion, would occur in the flowing water. If water is present during the construction, the water would be diverted by construction of a low flow channel or installation of a pipe.
- A qualified biologist (knowledgeable of steelhead and tidewater goby) shall monitor project construction in critical times, (during de-watering of the creek, or installation of a diversion including pipes in the creek). Monitoring would be performed every week at the beginning of construction in the creek and every other week after commencement of the project construction as long as construction is occurring within the creek bed.
- Minimize adverse effects during construction and subsequent maintenance to steelhead and tidewater gobies.
- Implement a design which causes no constriction to the creek bed, and hence no increase of water velocity compared to existing conditions.
- Create flow conditions conducive to the passage of steelhead through the length of the project on Mission Creek.

The construction area would be dewatered to avoid sedimentation impacts downstream. Best Management Practices (BMPs) would be used to further reduce impacts to the stream. Water remaining in the work area after creek diversion would be removed with a submersible pump. During pile-driving and construction of the two abutments, or other similar activities that would increase turbidity, sediments would be removed by means of settling or filtering of water before discharge to the creek, downstream of the work area.

Methods may include using Baker Tanks or hay bale/sandbag basins lined with filter fabric.

During concrete pouring activities, when the groundwater may come in contact with fresh concrete, contaminated water would be pumped out of the work area. The contaminated water would be hauled away in trucks or pumped into a city sewer main after the ph has been tested and adjusted to pre-project levels. No water that is contaminated with fresh concrete would be returned to the creek. The bridge CISS piles, or other option pile systems, would, due to the method of construction, prevent concrete contact with the water. The bridge deck would be constructed in a way that avoids discharging grout and other construction materials into the live stream channel work area. The abutments would be isolated from the live stream channel by dewatering. A temporary diversion, constructed of silt-free gravel bags and plastic sheeting, would direct water into a culvert. The culvert would discharge downstream of the work area. In the event of an accidental grout discharge, the contractor would be required to remove any such accidentally discharged materials from the streambed immediately.

Refueling/Maintenance
Maintenance of construction equipment would take place in the staging area/lay down areas. At a minimum any refueling or maintenance of project equipment would either occur more than 100 feet from the lagoon or within secondary containment around the maintenance/refueling operation within the staging areas. A spill prevention and cleanup program would be included that provides for training to minimize spills, techniques/procedures to address spills that do occur, and that details equipment and supplies to be kept on the site to adequately clean up and properly dispose of spilled materials. In all cases fueling and maintenance would also follow the applicable best management practices outlined in Public Works' "Procedures for the Control of Runoff into Storm Drains and Watercourses".

Construction Equipment

The anticipated equipment for construction would be as follows:

- Work trucks, service trucks, semi's and flat-bed delivery trucks
- "Ten-Wheeler" dump trucks
- Maintenance & fuel trucks
- Concrete saws, jackhammers, concrete breaking equipment
- Excavators with implements for "digging" and "breaking"
- By-pass pumps, piping, cofferdams and associated equipment for water diversion and dewatering.
- Excavators with implements for "Pile Construction"; core barrels, augers, cast-in-steel shell pile construction equipment.
- Drilling equipment for pile construction including "Mud" pumps, Baker tanks and mud shaker
- Back hoes
- Wheel Loaders
- Skip Loaders
- Forklifts to handle materials such as shoring and formwork

- Welding equipment
- Carpentry equipment
- Paving equipment: paver, rollers, material & service trucks
- Landscaping equipment---tree removal, and planting
- Boom trucks and splicing equipment for utility relocations
- Demolition equipment for removal of building(s), bridge, trees, channel lining, pavement, curb, gutter, sidewalk
- Cranes for material handling
- Concrete pumping equipment
- Concrete finishing equipment
- Striping /Stenciling equipment; roadway stripes

Mason Street Bridge Project Description

Introduction

The City of Santa Barbara (City), in cooperation with the California Department of Transportation (Caltrans-District 5) and the Federal Highway Administration (FHWA), proposes to replace Mason Street Bridge over Mission Creek (Bridge No. 51C-287) as a part of the Lower Mission Creek Flood Control Project (LMCFCP).

Project Location

The proposed project is located on Mason Street, between State Street and Chapala Street in the City of Santa Barbara, Santa Barbara County, California. The Mason Street Bridge spans Mission Creek lagoon.

Purpose and Need

The City of Santa Barbara proposes to replace the existing bridge for the following key reasons:

1. The existing bridge is “too short” to accommodate the proposed channel widening for the LMCFCP. The existing bridge is about 35-feet wide: the new channel will be 55-feet-wide. As such, a bridge 55 to 60 foot-wide bridge is anticipated for this location.

2. The existing bridge is “structurally deficient”. It does not meet the current code for bridge construction—and cannot be feasibly retrofitted. It has served its useful life and should be reconstructed to accommodate modern loads and changed conditions to the watershed.

3. The existing bridge does not meet other current codes including: shoulder/lane width, bridge rail height and strength, roadway geometry, curb type, and sidewalk width. The approach roadway may have substandard sight distance because of the pronounced “hump” in the profile of the centerline—this aspect would be investigated during the design.

Existing Conditions

The bridge carries vehicular, bicycle, and pedestrian traffic. The bridge also supports existing underground utilities including at least water and gas lines.

Mission Creek is not considered a perennial stream, but in the vicinity of the project it forms a lagoon that is influenced by the Pacific Ocean and is subject to tidal influence. The general location setting is “urban”; with commercial (retail and hotel) and residential buildings nearby. The channel is “lined” upstream and downstream. The eastern side of the upstream segment is the most natural, although a large retaining wall is buried below the surface to protect the Kimberly Ave. corridor from scour.

The existing curb-to-curb width is about 23.5 feet. The overall width, between the wooden bridge rails, is about 32 feet. A 3 to 4 foot-wide sidewalk exists on each side of the bridge, separated from the automobile travel lane by a non-standard curb. The automobile travel lanes are about 11.5-feet-wide. There is no centerline stripe, and no edge stripes (no shoulders) on the bridge.

Inspection records indicate that the bridge was retrofit in the 1950's. At that time the wooden superstructure was likely replaced with the reinforced concrete bridge deck units currently there. These pre-cast deck units were apparently placed on the existing sandstone abutments, which were likely retrofitted to accommodate this concept. Underground utilities were likely altered to cross the replacement deck as well. It is believed that the 4 square pads in the creek may have been used for the bridge deck replacement.

Some water usually remains in the channel all year, but the amount depends on weather and the magnitude of the sand bar that "dams" the creek lagoon at the outfall, downstream of Cabrillo Blvd.

Proposed Bridge

The replacement bridge would be constructed to current codes. The bridge would be a single span of about 55-feet. The deck would be reinforced concrete; either cast-in-place or prefabricated pre-cast/pre-stressed components, and brought on-site.

The curb-to-curb width of the bridge would be approximately 38 feet, to match the existing roadway width outside of the limits of the existing bridge. This concept removes the current roadway "bottleneck" at the existing bridge.

The proposed bridge cross section would include two 12-foot-wide vehicle lanes, two 7-foot–wide bike lanes/shoulders, and two 6-foot wide sidewalks creating an overall width of approximately 48 feet. The proposed curb would be 6 to 9-inches-high, depending on the need determined in detailed design.

Concrete bridge rails would be custom-designed for this location: the architectural look has not been defined. The bridge rails would be at least 43-inches high.

Bridge Foundation

Replacement of the bridge would require a stream diversion to control surface water, and a ground water dewatering system to control sub-surface water, during construction. The bridge would be supported on a pile foundation (likely cast-in-steel shell). On top of the piles, a pile cap would support the abutments, which would support the bridge deck above.

The new abutment walls could be constructed to match the existing sandstone abutments (using form liner and colored concrete) but as this treatment would not be readily visible, the City may want to consider this expense.

Bridge Transition Walls

The channel adjacent to the bridge would be widened to about 55-feet-wide to accommodate the future LMCFCP. The stream channel walls adjacent to the bridge would be supported by "transition walls", (these walls "transition" the channel geometry to the bridge geometry on either side of the bridge). The transition walls would be constructed for a length of 70 to 80 feet on 3 of the 4 corners; the exception being the 15 W. Mason Street property, where the walls would be shorter in length and perhaps height, in order to provide a natural bank at this location. The surface finish of the walls would mimic the original sandstone walls and would be in service until the overall LMCFCP is constructed.

Sidewalk

Construction of curb, gutter and sidewalk would involve excavations up to two feet deep. Soils would be compacted and a 4 to 6 inch layer of concrete would be placed to form the new sidewalk.

Construction Easements

Temporary construction easements, allowing construction access to cross private property, would likely be required for construction access. Temporary easements may be required for relocation of the overhead utility lines. At this preliminary stage, temporary construction easements, of various sizes, may be required for about 10 properties on Mason Street, and about 4 properties on Kimberly Ave. This would not be confirmed until the detailed design phase of the project.

Right-of-Way Acquisitions

Additional right-of-way is needed to build the proposed improvements. The LMCFCP EIR/EIS identifies 2 properties that would be affected by the proposed work.

The first property, at 16 W. Mason Street, is located in the corridor for the proposed Kimberley Avenue re-alignment, which is required to widen the bridge to match the channel alignment proposed by the LMCFCP.

The second property at 15 W. Mason is required in order to lengthen the bridge and match the alignment for the LMCFCP. The building at this location would be demolished to make room for the project, and provides the additional benefit of a "Habitat Restoration Zone" once the building is removed.

As design develops and the heavy construction layout is examined there may a possibility for more acquisitions. Specifically on building within a 20 foot distance to the pile driving that would most likely occur for bridge foundation work.

Landscaping

Native landscaping would be part of this project as detailed in the LMCFCP EIS/EIR. This concept was approved at the California Coastal Commission within the Coastal Development Permit application.

The LMCFCP EIS/EIR proposes an "expanded habitat zone" at the 15 W. Mason Street property. This area would be used for establishing riparian vegetation after the existing building is removed. This vegetation would remain when the infrastructure improvements are completed.

Trees

On the upstream side, a palm tree (which appears to be "dead") would be removed to make room for construction of the bridge. On the downstream side there is a triple trunk Sycamore tree that would be pruned, the most steeply leaning trunk would be removed, and the remainder of the tree would be protected in place.

Construction Sequence/Schedule

Proposed project construction would take approximately 18 months to complete. The project construction time could be longer depending on factors such as environmental restrictions and right-of-way negotiations.

Approximate sequence—and duration-- of the prime work tasks would include:

Close Roads/Create Detour: --1 month
Roads would be closed at the following locations:

- Mason Street at State St.
- Mason St. at private driveway 50 feet west of bridge
- Kimberly about 100-feet north of Mason St.

Demolition of Building(s) —1 month

- 15 W. Mason Street (currently offices for "Horny Toad")
- Possibly building at 16 W. Mason (currently a laundry) to make room for project.

Prune Trees: Possible tree trunk removal to allow safe access to work and protect work from falling trees. Concurrent with Building Demo.

Relocate Overhead Utilities to clear area for construction. —1 month

Temporary relocation of underground utilities if necessary; --1 month

- Anticipate that Gas, Water, and the 54-inch storm drain must be accommodated.

Bridge Demo: --1 Months

- Remove deck (precast "planks")
- Construct stream diversion for Foundation Construction
- Construct shoring system
- Remove existing abutments, interfering portions of existing stream transition walls, and existing bridge foundation

Foundation Construction --5 months
Construct Piles (type to be determined): Bridge and Transition walls in creek.
Construct Pile Caps

- Construct abutments

Construct Bridge Superstructure -- 4 Months

- Construct portions of bridge deck
- Relocate utilities to new bridge
- Complete bridge superstructure
- Remove stream diversion
- Construct bridge rails

Construct approach roadways: curb, gutter, sidewalk, drainage,--2 months
(starts concurrently with bridge)

Landscaping-- --1 Month

Final clean up/Demobilization. --1 Month

Times represent rough estimates using the limited information available at this time.

Traffic Control

Because of the limited work space, portions of the local streets would be closed. Traffic detours would be signed and posted to make the traveling public aware of such closures. The closure would be coordinated with local neighbors and business to allow access.

Construction Staging Area

Lay down would occur in the portions of the streets that would be closed to traffic. The 15 W. Mason Street property would provide an additional staging area, after the demolition of the building. In the event the building at 16 W. Mason Street is acquired, for the realignment of Kimberly Ave., this space would be utilized as well.

Resource Protection Measures

General

The project corridor has been studied extensively in the Lower Mission Creek Flood Control Project EIS/EIR which details the impacts and protection measures required to protect the resources. Attached is the matrix of biological, water quality, traffic, archeological, landscaping, and construction measures aimed at protecting the natural resources in the area derived from then EIS/EIR. The project includes these measures to protect the resources in the area. Biological and water quality related and measures have been incorporated into the diversion/dewatering plan and other aspects of the project.

Water Diversion/De-watering

No construction except installation of diversions devices and water diversions properly overseen by a fisheries biologist shall occur in the flowing water. When work in a flowing stream is unavoidable, the entire stream flow shall be diverted around the work area by a barrier, temporary culvert, new channel, or other approved means. Construction of the barrier and/or the new channel shall normally begin in the downstream area and continue in an upstream direction, and the flow shall be diverted only when construction of the diversion is completed. Channel bank or barrier construction shall be adequate to minimize seepage into or from the work area. Diversion berms shall be constructed of low silt content, inflatable dams, silt free sand bags, sheet piles, or other approved materials. Channel banks or barriers shall not be made of earth or other substances subject to erosion unless first enclosed by sheet piling, rock rip-rap, or other protective material. The enclosure and the supportive material shall be removed when the work is completed.

Flow diversions shall be done in a manner that shall prevent pollution and/or siltation and which shall provide flows to the lagoon. A connection between downstream and upstream reaches shall be provided during all times. Diverted flows shall be sufficient quality and quantity, and of appropriate temperature to support fish and other aquatic life around the diversion; flows shall meet or exceed baseline conditions. Baseline conditions would be established prior to construction and monitored upstream of any work area. Normal flows shall be restored to the affected stream immediately upon completion of work at that location.

No construction work would be allowed in water in the estuary from December 1 to June 1st. The City's anticipated method of dewatering the lagoon, from June 2nd, to November 31st, would involve the following specific steps:

1. A qualified biologist familiar with aquatic species native to Mission Creek would be present during the diversion operations.

2. A row of sheet piling or equivalent would be placed in the approximate middle of the stream about 1 foot apart and vibrated or driven to adequate depth into the lagoon floor by equipment on the creek bank.

3. A barrier (sheet piles, sand bags, or equivalent) would be placed on the upstream side between the end of the row of sheet piles and the creek bank to block one end of the diversion.

4. A qualified biologist shall walk downstream in a zigzag pattern to herd as many fish as possible from the incipient enclosure

5. Fish biologists shall seine the entire contained half thoroughly to remove any gobies and other large organisms to the wet side of the construction enclosure.

6. After sufficient effort has been completed to move fish out side of the diversion area the downstream end blocking nets would be installed to cordon off the area and the area would be blocked off to water in a manner similar to the upstream side.

7. The portion of the lagoon that has been enclosed would be seined by the biologist to capture any remaining fish and any remaining fish would be relocated outside the enclosed area in the lagoon.

8. Pumps with adequate sized screening would be used to dewater the area. Water would be pumped into a bladder(s), for discharge into the lagoon, when water quality warrants or to a tank for storage and off hauling if water quality is below that of receiving waters.

9. Fish biologists shall monitor the drying enclosure and seine it thoroughly at least twice a week.

10. When construction on one side has been completed, the downstream wall of the enclosure shall be removed first, followed by the upstream end.

11. The above steps shall be repeated for the opposite bank construction.

Maintenance/Refueling

Maintenance of construction equipment would take place in the staging area/lay down areas. At a minimum any refueling or maintenance of project equipment would either occur more than 100 feet from the lagoon or within secondary containment around the maintenance/refueling operation within the staging areas. A spill prevention and cleanup program would be included that provides for training to minimize spills, techniques/procedures to address spills that do occur, and that details equipment and supplies to be kept on the site to adequately clean up and properly dispose of spilled materials. In all cases fueling and maintenance would also follow the applicable best management practices outlined in Public Works' "Procedures for the Control of Runoff into Storm Drains and Watercourses".

Construction Equipment

The anticipated equipment for construction would be as follows:

- Work trucks, service trucks, semi's and flat-bed delivery trucks
- "Ten-Wheeler" dump trucks
- Maintenance & fuel trucks
- Excavators with implements for "digging" and "breaking"
- By-pass pumps, piping, cofferdams and associated equipment for water diversion and dewatering.
- Excavators with implements for "Pile Construction"; core barrels, augers, cast-in-steel shell pile construction equipment.
- Drilling equipment for pile construction including "Mud" pumps, Baker tanks and mud shaker
- Back hoes
- Wheel Loaders
- Skip Loaders
- Forklifts to handle materials such as shoring and formwork
- Welding equipment
- Carpentry equipment
- Paving equipment: paver, rollers, material & service trucks
- Landscaping equipment---tree removal, and planting
- Boom trucks and splicing equipment for utility relocations
- Demolition equipment for removal of building(s), bridge, trees, channel lining, pavement, curb, gutter, sidewalk
- Cranes for material handling
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APPENDIX - A-1

REVISED BIOLOGICAL ASSESSMENT
TIDEWATER GOBY
LOWER MISSION CREEK FLOOD CONTROL PROJECT
SANTA BARBARA, CALIFORNIA

PREPARED BY

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

JUNE 2000

BIOLOGICAL ASSESSMENT
pertaining to

TIDEWATER GOBY (*Eucyclogobius newberryi*), LOWER MISSION CREEK FLOOD CONTROL PROJECT, SANTA BARBARA, CALIFORNIA

1 INTRODUCTION

The US Army Corps of Engineers (the Corps) prepared this revised Biological Assessment (BA) to comply with the Endangered Species Act of 1973, as amended (the Act). The Corps previously submitted in December 1999 a BA to the US Fish and Wildlife Service (FWS) with the Draft EIS/EIR for the proposed Lower Mission Creek flood control project in Santa Barbara, California.

Two Federally listed species, steelhead and tidewater goby, occur in Mission Creek. Two separate BAs have been written to identify project related impacts, implementation of environmental commitments to minimize or avoid impacts to these species, and implementation of compensatory mitigation for impacts which may nonetheless occur to these species because of this proposed action. This revised BA concerning potential adverse effects on tidewater gobies would be submitted to FWS, because that agency has authority to ensure this species would not be jeopardized by implementation of the project.

Subsequent to release of the Draft EIS/EIR design modifications of the project to avoid impacts to cultural resources became necessary. Structural changes in design would occur upstream of the estuary, beyond the waters which gobies would ordinarily inhabit. These modifications include: extension of the bypass culvert from 540 to 830 feet in length and a change in size and orientation of a weir to control the movement of water into the culvert. The Project Description attachment presents a thoroughly detailed project description. These changes led to recalculation of numerous hydraulic projections of the proposed project. These modifications do not alter the analysis of potential impacts to tidewater gobies as presented in the original BA which the Corps submitted in December 1999. The Corps coordinated extensively with your office staff and other involved resource agencies in development of the modified project design and hydrological analyses. This revised BA includes more detailed hydraulic evaluations of the proposed project. Those further analyses gave rise to additional mitigation features. The BA also incorporates those structural features to be built in the estuary to mitigate unavoidable project related impacts to the population of tidewater gobies in Mission Creek and to the aquatic habitat they depend upon.

1.1 LIMITING FLOOD DAMAGES ON LOWER MISSION CREEK

The US Congress originally authorized feasibility analyses of various alternatives to curtail Mission Creek's tendency to flood as a Water Resources Development Authorization in 1962. The plan which the Corps devised to accomplish that Congressional directive would reduce flood damages and partially redress historical deterioration of riparian habitat within the project's limits (Corps, 1999).

As proposed, the final portion of the existing stream channel, between Canon Perdido Street and Cabrillo Boulevard, would be widened to accommodate greater peak discharge, 3400 ft^3/sec, than this last section of Mission Creek presently conveys, about1050 ft^3/sec. In addition, an underground culvert designed to take on water in flows greater than 640 ft^3/sec would carry about ⅔ of the creek's conveyance past the narrowest place in the existing watercourse, a constriction in the so-called oxbow channel. Greater width of the streambed would come through excavation of existing stream banks. Except through the oxbow channel, it would have a natural bottom. It would be maintained regularly to preserve the operational characteristics of its design.

The streambed would be confined between vertical walls built in most places to half the height of the existing bank tops, on average between 3 and 6 feet. Those walls at the toe of the banks would constrain the currents, define the ordinary high water level somewhere up their sides, and form the load-bearing support to keep the upper part of the new banks in place. The banks exposed above the toe walls would be planted with native species of canopy and understory plants adapted to stream side habitat in southern coastal California. The Project Description enclosure, attached, presents all details of projection description.

1.2 PARTICIPANTS IN FLOOD CONTROL PROJECT

The Corps is the lead Federal agency. Santa Barbara County Flood Control and Water Conservation District is the direct co-sponsor of the proposed action. In addition, an agreement was developed between the Flood Control District and the City of Santa Barbara. These two entities would share the non-Federal cost of the project.

1.3 TIDEWATER GOBY *(Eucyclogobius newberryi)* Girard, 1857 IN MISSION CREEK

The estuarine conditions found in Mission Creek between Cabrillo Boulevard and Yanonali Street provide foraging habitat for tidewater gobies. The species was detected in the estuary in 1994 (Lafferty and Altstatt, 1995), specifically just upstream of the Mason Street bridge (Lafferty, 1998). Biologists from the FWS, National Marine Fisheries Service, and the Corps of Engineers searched diligently but found no tidewater gobies anywhere in Mission Creek during site visits in May, 1999. Likewise, visual scrutiny of parts of the estuary during a low tide in early May 2000 turned up no sightings of tidewater gobies.

Tidal fluctuations influence the extent upstream of estuarine conditions. Brackish water has, at times, reached only as far upstream as Mason Street while at other times gone nearly to the Yanonali Street bridge. An artificial sill shaped from poured concrete and about eighteen inches high spans the entire width of Mission Creek at that latter bridge. Under normal tidal influences and stream currents, this man made barrier probably constrains estuary water from going above Yanonali Street and thereby usually marks the upstream limit of possible habitat for tidewater gobies.

The historic man-made diversion channel between Yanonali Street and Highway 101 has a lining of hewn and mortared sandstone blocks and has a concrete bottom, somewhat fragmented. It affords virtually no cover of any kind. This segment of Mission Creek's channel, roughly 530 linear feet of the existing water course, would seem a biological desert sufficient to deter gobies from ever trying to swim farther upstream. However, gobies do swim considerable distances upstream in other drainage systems, prompting the designation of critical habitat as far upstream as 1.3 km (0.9 mi) at San Mateo Creek and 5 km (3.1 mi) up the Santa Margarita River in San Diego County (U.S. Fish and Wildlife Service, 1999b). Most likely, the species ranges in Mission Creek only between the coastal lagoon (where Mission Creek reaches the ocean south of Cabrillo Boulevard) and Yanonali Street.

Seasonal presence of this lagoon probably depends on a rough balance between runoff of fresh water coming down Mission Creek, in the winter and spring by and large, and the summertime deposition by long-shore transport currents and local wave action of a sandbar which blocks the mouth of Mission Creek. Tidewater gobies spawn in such lagoons, where proper conditions of salinity, water temperature, and coarse sandy bottoms persist from spring or early summer through the onset of winter rains (Swift, *et al.*, 1989). Males establish small breeding territories, scoop out small depressions, then wait for females lay eggs in the depressions. Males may guard eggs and young fry from several females.

Tidewater gobies have an annual life cycle. Numerous recent experimental studies (U. S. Fish and Wildlife Service, 1999a) paint a combined picture of a species classically described as being "r-selected", i.e. one whose ability to disperse to unoccupied habitat, inherited tolerance of broad and sometimes variable ecological conditions of that habitat, and whose reproductive traits allow it to populate any suitable site in a very short time make the species' overall reproductive behavior approach nearly the maximum rate of which it is capable. The "r" refers to that tendency to turn out many young quite quickly in accordance with the intrinsic rate of reproduction characteristic of that species in these environments.

Tidewater gobies seemingly will eat whatever is available that is of about the right size, including small assorted crustaceans, the aquatic larvae of many insects, and snails (Irwin and Soltz, 1984; Swift, *et al.*, 1989). The species has evolved in transient coastal environments which favored the physiological ability to convert those nutrients into large numbers of young. Such species are also prone to sudden disappearances of local populations. Over time, they usually exhibit a pattern of very high numbers for a few generations, then dramatic crashes of numbers. Often dispersal from nearby populations brings new groups of genes into a local population, which may stimulate a quick resurgence of numbers. This general pattern may lie behind the seemingly low numbers of tidewater gobies in the Mission Creek system over the last decade.

1.4 CRITICAL HABITAT FOR GOBIES

Critical habitat for tidewater gobies has been designated (U.S. Fish and Wildlife Service, 1999b). All the watersheds included in that decision occur to the south of Aliso Creek, in Orange County. Mission Creek does not provide habitat critical to the continued existence of tidewater gobies.

2 Interagency Consultation

Section 7(a)(3) of the Act requires active consultation between the lead Federal agency and FWS in any circumstance in which the lead agency concludes that its proposed action could affect an endangered or a threatened species. Direct effects and indirect effects must both be evaluated. In December 1999, the Corps initiated formal Section 7 Consultation. During preparation of the

Draft EIS/EIR extensive coordination occurred between Corps and FWS staff including reciprocal exchanges of information, discussions of habitat requirements, techniques of field observation, schemes to minimize influences on species while still accomplishing the stated purpose of the proposed project, cooperative site visits, exchanges of written ideas and information, fulfillment of requirements under other pertinent laws, and so forth. The Corps and FWS have been engaged in such a dialogue since December 1997. Biologists from both agencies have together walked the entire length of the proposed flood control project to evaluate streambed conditions, general habitat of creek and banks, and importance of the lower reaches of Mission Creek as potential spawning or nursery habitat.

The Act requires formal consultation when the agencies determine that a proposed action "may affect" a species listed under and protected by the Act or habitat critical to the species' continued survival. The lead agency initiates formal Section 7 Consultation with a written request, which includes a Biological Assessment, to FWS [Section 7(a)(2) of the Act] and concludes when FWS issues a written Biological Opinion [Section 7(a)(3) of the Act].

The Corps submitted a Draft Biological Assessment to FWS in December 1999. Since then, refinements of hydraulic calculations, sediment budgets, and design features have been under way. Those various supplements are included as separate enclosures which accompany this revised BA. The first of them is the complete and detailed Project Description. The second is the Final Hydraulics Documentation (Hydraulics appendix). The third enclosure consists of Preliminary Design Plans. The fourth enclosure is an independent analysis of shading patterns predicted from the arrangement of trees and shrubs to be planted as part of the project (the Shading appendix). The fifth and final enclosure is the Mitigation Monitoring Plan. This Mitigation and Monitoring Plan would include recommendations by your office, and then incorporated as Appendix H of the Final EIS/EIR.

Based on this revised analysis and the conclusion by the Corps that construction of the proposed flood control channel along lower Mission Creek may affect tidewater gobies in the estuary and the coastal lagoon downstream of it, the Corps re-initiates formal Section 7 Consultation with the US Fish and Wildlife Service.

3 EXISTING CONDITIONS

Estuarine and riverine aquatic conditions occur within the area of the project and both portions of the creek have extensive urban influences. The proposed flood control project would necessitate construction in both portions.

The descriptions which follow treat the goby population of Mission Creek as resident just within the estuary, but recognizes that estuary itself as the final portion of the creek's aquatic habitat. As such, various activities upstream might conceivably influence tidewater gobies, at least indirectly. For that reason this section needs to be the prelude to understand how the various changes (described in Chapter 5, below) which would occur upstream of the estuary — changes of the streambed, sedimentary regime, and subsequent requirements for streambed maintenance — would affect that aquatic habitat, and finally how changes to the existing vegetation on the creek's banks would directly improve water conditions upstream of the estuary and ought to have indirect beneficial effects within the estuary. Overall and after maturation of native plants to be included, the proposed flood control project would have greater biological values when compared to the expectations of future conditions in the absence of this project.

3.1 THE ESTUARY'S STREAM CHANNEL AND BANKS

As best Lower Mission Creek may be characterized, its aquatic habitat equates, roughly, to prevailing conditions below the ordinary high water mark, which over the actual length of the streambed included within this project (5380 linear feet) passes from fresh water at its upper end to saline at the lower end. Fresh water in character from Canon Perdido Street to Yanonali Street, 4320 linear feet (approximately 80% of the project length), Mission Creek is just barely a perennial stream however. Indeed, urban runoff alone may prevent the disappearance of surface water after late summer. Estuarine traits prevail from Yanonali Street to Cabrillo Boulevard (about 20% of the project length), becoming more pronounced since the daily interchange of fresh and salt water is greater closer to Cabrillo Boulevard. Commercial and residential development which took place historically along this last section of creek now constrain it within a nearly artificial channel:

- no mudflats dissected by tidal creeks remain anywhere along the estuary;
- no tracheophyte plant species ecologically associated with functional coastal marine communities remain anywhere along Mission Creek;
- except for a short gap in man-made revetments fashioned around a large sycamore tree immediately below the Mason Street bridge, no natural bank or vegetation exists between Yanonali Street and State Street on the right-hand side of the creek (looking downstream), about 1060 linear feet;
- Where natural bank exists on the left hand side (two unconnected lengths of bank without revetment and about 320 linear feet long in total) no native trees or shrubs of any kind remain. A band of pampas grass (*Cortaderia jubata*) upstream from the State Street bridge makes up nearly 175 linear feet of that total.

Gobies which reside in the creek have direct passage back and forth between the lagoon and estuary by way of the bridge at Cabrillo Boulevard. The existing banks between Cabrillo Boulevard and the State Street bridge (50 linear feet on the right hand side, about 150 linear feet on the left) are lined by shrubby ornamentals (*Myoporum* cf. *insulare)* which overhang the edges of creek somewhat. These shrubs shade the water along the sides of the channel and probably afford gobies and other small fish some shelter. However, they also afford splendid perches just above the water for two bird species, both predators of small fish — green-backed and black-crowned night herons (*Butorides striatus* and *Nycticorax nycticorax*, respectively) — which have been seen there repeatedly awaiting their chances for a quick meal. A cluster of sycamores (a one individual with multiple trunks) just below the Mason Street bridge shades a length of perhaps 70 feet of the creek. Three bridges, Cabrillo Boulevard, State Street, and Mason Street, undoubtedly provide sheltered areas of water which gobies would seek out at times.

Estuary Conditions: Saline water from the ocean mixes with fresh water at the lowest end of Mission Creek, at variable locations between State and Yanonali Streets. Its length varies seasonally as judged by the upper limit at the moment where clumps of the filamentous green alga (*Enteromorpha* sp.) float about, the simultaneous partial stratification and mixing between saline and fresh water layers can be seen, and indicated by the presence of topsmelt, sculpins, and other species intolerant of fresh water. In September 1997, for example, estuarine properties became evident ⅔ the way between Yanonali and Mason Streets. In December 1998, fresh water began to mix with salt about 30 feet downstream of Mason Street. During the rainy season, runoff of large storms evidently pushes salt water as far down the channel as Cabrillo Boulevard (Fig. 1).

Measurements of relevant water chemistry properties reveal this seasonal influence. The City of Santa Barbara engaged a private contractor to sample water in Mission Creek at two locations on a weekly schedule beginning in late November 1994 and continuing through October 1995. Sampling locations are about 65 yards apart. Samples came from the upstream side of the

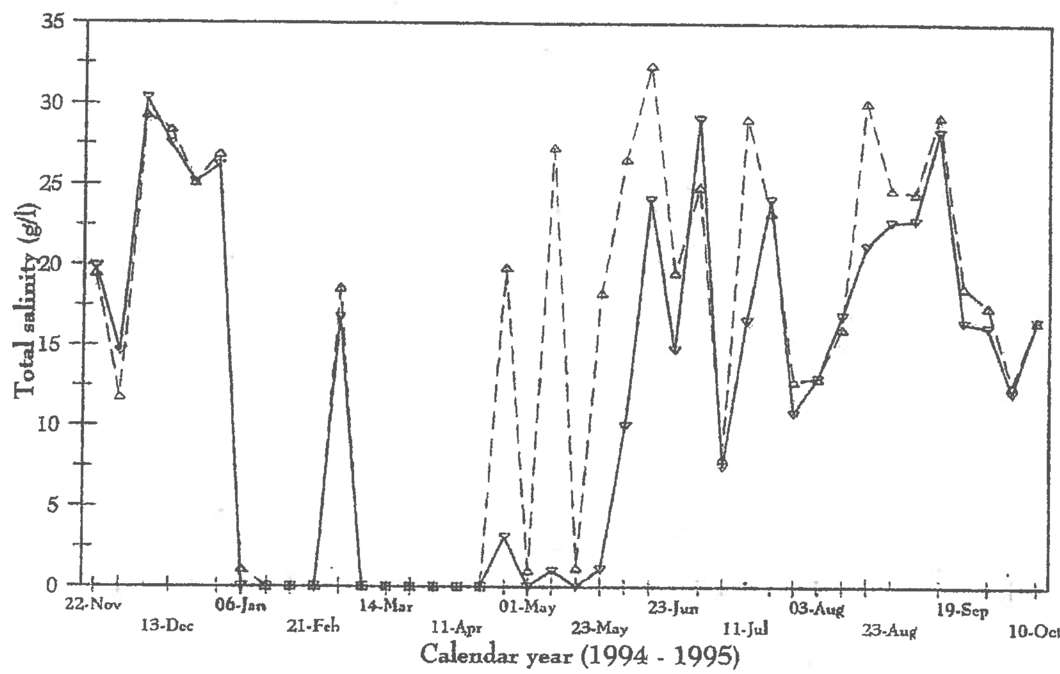


Fig. 1. Salinity (measured in grams per liter, g/l) at two sampling locations the Mission Creek estuary. Measurements shown by the dashed line came from the upstream side of the Cabrillo Boulevard Bridge; those shown as a solid line were taken on the upstream side of State Street Bridge. Despite a few dates when salinity differs between the two sample locations, the differences between them overall are not significant, $p(F_{1,76} = 1.501) = 0.22$.

Cabrillo Boulevard bridge, and those from farther up the estuary came from the upstream side of the State Street bridge (City of Santa Barbara, 1995). No details of sampling techniques are available.

Water in the open ocean off Santa Barbara would have a total salinity approximately 35 grams per liter (g/l). Water in this lower part of the estuary is somewhat diluted in the summer months, approximately 20 g/l, and may be virtually free of salt during times in the wet season (Fig. 1). Peak salinities (approximately 30 g/l) occurred between mid-June and early January that year, when the minimal amount of water flows from the Mission Creek watershed. During the winter months, steady runoff sweeps saline water out of the lagoon and salinities were below the sensitivity, less than 1g/l, of the measuring instrument (a refractometer). Note an anomalously high spike of saline water (18 g/l) about the 1st of March 1995.

Salt concentrations recorded during this calendar year exhibit the range and seasonal proclivities tidewater gobies are known to inhabit (US Fish and Wildlife, 1999b).

Overall, the estuarine water just before Mission Creek opens into the lagoon contains rather little suspended sediment, as measured by total turbidity of the water column (Fig. 2). With the exception of two sharp increases of turbidity caused by heavy run off, the first in mid-January and the second in mid-May of 1995, turbidity ranges from levels less than 1 NTU to about 10 NTU.

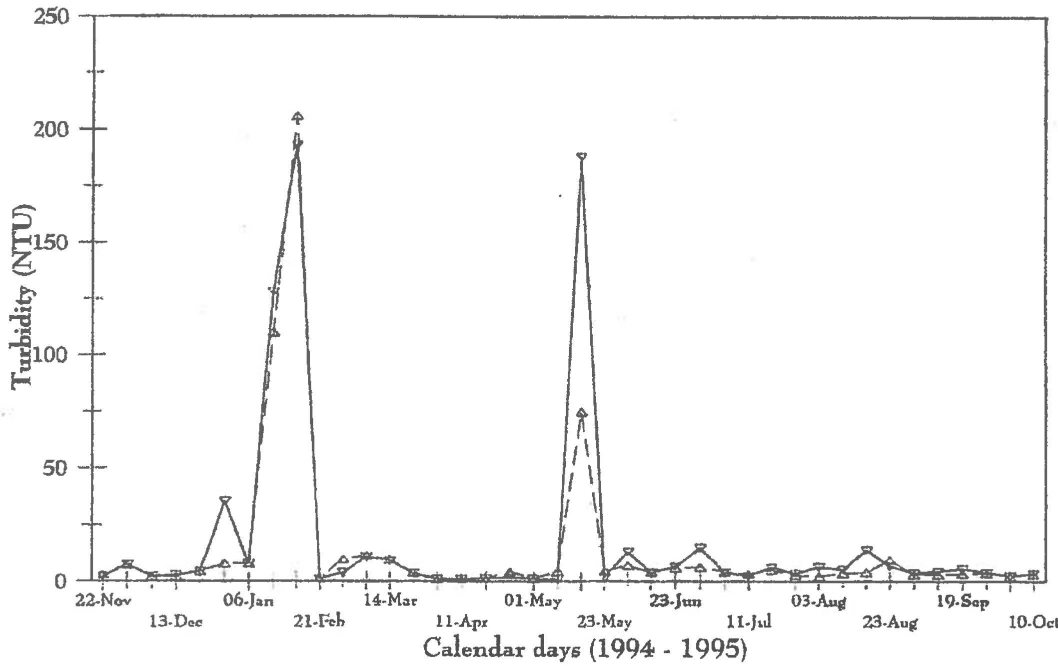


Fig. 2. Total turbidity (measured in nephelometric turbidity units, NTUs) at two sites in the Mission Creek estuary. Lines and symbols follow the convention of Fig.1.

While not a measurement which most people commonly encounter, nephelometric turbidity units (NTUs) provide a quantitative measure of light scattering by all the solids suspended in a water sample: e.g., a glass of water measured as about 15 NTU looks faintly cloudy to the eye.

Sediments contributing to turbidity of Mission Creek would seem to originate from rather different sources in a manner also linked to climatic seasonality. The meager and non-continuous flow down Mission Creek seen in September 1997 would be incapable of transporting sediments a significant distance along the channel. Urban runoff from streets that enter via storm drains under bridges, particularly at Mason Street, could add somewhat to turbidity farther downstream, but most of the opacity of water in the estuary is probably due to roiling of the water caused by daily tidal fluctuations. The rise in stream volume and velocity coinciding with the onset of winter rains would carry sediments through the estuary and out into the lagoon, and could reasonably account for the fluctuations seen between December and May of 1995 in Fig. 2.

3.2 AQUATIC HABITAT UPSTREAM FROM THE ESTUARY

A sequence of man-made structures form a substantial portion of the existing watercourse through which steelhead have to pass. This section probably follows the naturally incised channel although that is not now evident. Mission Creek first bends to the right just above Highway 101, creating a feature known locally as the oxbow. In very quick succession thereafter, the oxbow leads water beneath the freeway (a box culvert bridge 140 feet wide), through a 60 foot length lined by riprap and wing walls, beneath Montecito Street (also a box culvert bridge, 60 feet wide), through a 20 foot section lined again by wing walls, beneath the bridge which elevates the railroad tracks (a central pillar bridge 70 feet wide), and then bends back to the left at the upper end of the historic sandstone-lined channel. The sandstone channel has a concrete bottom and carries water as far as the bridge at Yanonali Street (about 530 in length). The transition from fresh to brackish water effectively begins directly beneath the Yanonali bridge where a sill roughly 15 inches high spans the full width of the creek bed (entirely concrete at that point) and marks the upper limit of tidal influence, except perhaps during very severe winter storms.

In both the fresh-water and the estuarine segments its aquatic properties have been influenced to a very great degree by individual property owner's decisions to armor streambanks on their property, the toe of those banks, and even the creek bed itself in many locations against erosion. Where concrete was placed below the ordinary high water mark, the result can be a solid projection into the low flow path of the creek in some places, a uniformly broad, flat surface (e.g. upstream of the Gutierrez Street Bridge), or concrete edges that confine the creek's low flow route to a narrow course. Estimates of the length of the streambed where only natural surfaces are evident (admitting the probable existence of some concrete now covered thoroughly by native sediments) were made by walking the creek. Natural sediments (silty muds and gravels) compose the streambed for about ⅔ of its length within the project area (3560/5380 = 0.66), while hardened surfaces cover roughly ⅓ the length of the stream bed (1820/5380 = 0.33).

The County Flood Control presently cleans the fresh-water portions of the creek as needed to remove accumulated sediments, obstructive growth of plants, and accumulated debris. Sporadic accumulation which diminishes its conveyance capacity by more than 15% triggers that need for maintenance. That maintenance procedure has stripped the creek bed of most natural features that would have contributed to a heterogeneous stream channel. In fact, virtually all pools in this reach of Mission Creek have formed where complex hydraulic interactions between man-made structures and currents caused differential erosion and deposition of sediments. They are also transient for that very reason, and therefore tend to change in size from one season to the next. Those at bridge abutments are largest, e.g. estimated as 5 feet deep, 15 feet wide, and 40 feet long. Two such pools existed in May 1999. Concrete ledges poured by private owners have also created pools where currents undercut them. The longest seen in May 1999 was estimated as 25 feet in length and possible 4 feet deep. The smallest such ledge pool was about 7 feet in length and perhaps a foot deep. Four undercut concrete sills of this nature were identified in May 1999. Two natural pools have formed amid rocks and concrete rubble in the oxbow. Each was approximately 10 feet long, 1½ feet deep and as wide as the channel. While these isolated pools were evident in May 1999, on the whole Mission Creek lacks any substantive areas of runs, riffles, pools, turbulent waters and eddies.

3.3 STREAM BANK VEGETATION

Construction of walls, an essential component of the project's design and without which the footprint of direct impacts would have to be twice as large to achieve the same conveyance, would require removal of most extant vegetation along 78% of the lower reach of Mission Creek, about

8420 linear feet (counting both the right and left banks). The remaining 22% of its existing banks, about 2340 linear feet (on both sides of the channel) between Highway 101 and the downstream side of Yanonali Street, are entirely bare of plant growth.

In those areas to be disturbed by stream bank construction, the presence of hardened bank surfaces currently exerts a strong effect on the abundance and vigor of plants along the creek. A soft bank occurs along 1940 linear feet of stream bank (counting both sides), while 6,480 linear feet (measured on both sides) have been armored by some means or other. In essence, hardened surfaces line about 77% of the creek's banks, aside from that stretch between the freeway and the upper most end of the estuary. Section 10 of the EIS/EIR provides details on existing vegetaion within the project reach. Maintenance, monitoring goals, success criteria for native plants to be included in the project's design, and so forth are identified in the Mitigation Monitoring Plan.

These revetments, of quite diverse materials and thoroughness, are not uniformly solid and impenetrable by plant roots. However, plants native to a stream side habitat in southern California are few and far between. Save for large and venerable western sycamores (*Platanus racemosa*) at six locations along the creek, it retains almost none of the stratification of canopy and understory species it must have had a century and more ago. Widely scattered arroyo willows (*Salix lasiolepis*) and white alders (*Alnus rhombifolia*) growing even more sparsely hint of what was once there below its riparian canopy, but nothing more than hint. Invasive non-native species compose virtually the entire plant assemblage along the creek. Now, giant reed (*Arundo donax*) forms the most conspicuous element of stream bank vegetation, and probably would rank highest in biomass of anything growing along the creek.

4 POTENTIAL EFFECTS TO TIDEWATER GOBY

4.1 Locus of Project along Lower Mission Creek

The proposed flood control construction along Mission Creek would extend from Cabrillo Boulevard at the downstream limit to the intersection of Castillo and Canon Perdido Streets at the upstream end of the project (Fig. 3). It would entail:

- mechanical excavation and expansion of the streambed (except through the oxbow channel),
- construction of vertical walls of varying heights,
- construction of a culvert to create an alternative flow which bypasses the oxbow at discharges greater than 640 ft^3/sec,
- fabrication of several structural mitigation features,
- planting native trees and shrubs along reshaped bank and at select locations adjacent to the banks.

Although disturbance to the creek bed and its banks would occur throughout the length of the project, since tidewater gobies are unlikely ever to be above Yanonali Street direct effects from construction activities should be confined downstream from there.

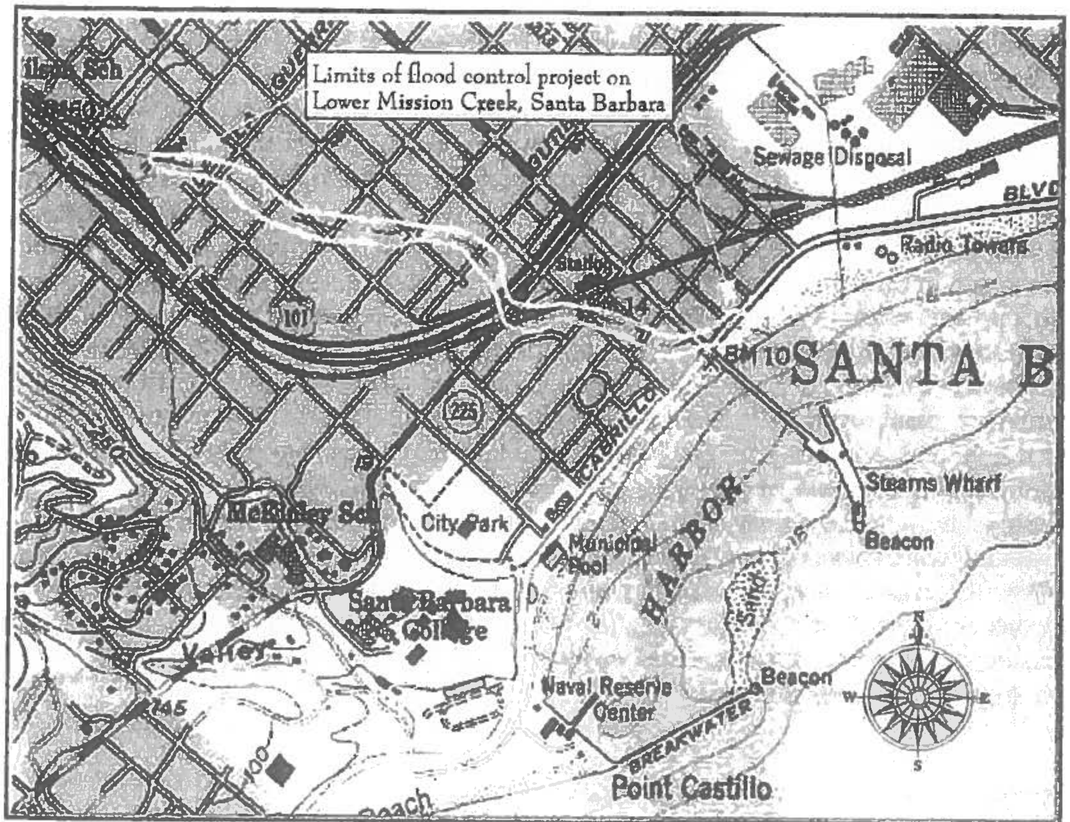


Fig. 3. Proposed flood control project would extend from Cabrillo Boulevard, at the lower end of Mission Creek, to Canon Perdido Street at the upper end. Excerpt from 7½ ' USGS map, Santa Barbara Quadrangle.

Full descriptions of the project's design along each section of the creek may be found as an attachment, Project Description. The effects of specific components of the design which pertain directly to ecological requirements of steelhead are described in Chapter 5, which follows.

4.2 Flood Control Construction and Future Maintenance May Affect Gobies

Construction between Cabrillo Boulevard and Yanonali Street. The most likely potential cause of adverse effects to tidewater gobies will lie in the necessity to build a temporary construction exclosure to dry the streambed and toe of banks prior to mechanical excavation. The scheme for flood control construction and its tentative scheduling would minimize this effect during the prime goby reproductive season through a combination of timing the work, on-site monitoring for and supervised relocation of fish, and means to de-water only half the creek at any one time. Nonetheless, netting and moving gobies in an approved manner would affect them temporarily and possibly adversely. Please refer to the Mitigation Monitoring Plan for a summary of project related mitigation and monitoring.

Release of tidewater gobies and other animals taken in seines from the drying exclosure into a suitable area, presumably of Mission Creek, may mean dumping assorted species together in quite unnatural densities and groupings of species. Until these refugees have dispersed, an unwitting interspecific melee could lead to gobies being confused and then eaten in numbers higher than typical.

Even after the water exclosure has been erected to dry half the creek, gobies would still have access to unrestricted water in the other half of the channel. However, it is conceivable that mechanical vibration originating from earthmoving equipment operating in the dry side of the exclosure could be transmitted through the ground and water. Such vibrations could be sufficiently irritating, or perhaps just sufficiently novel, as to dissuade gobies from swimming upstream past the construction area into higher reaches of the estuary, as they might be accustomed to do. Construction activities in the estuary could restrict their foraging to an area downstream of the vibration and potentially smaller in size than would otherwise be the case. That such a disruption of normal behavior may occur seems plausible. Should this happen, it would constitute an adverse effect on the population, although one of temporary duration.

Construction on the banks would remove what little vegetation now grows along the estuary. To the extent that plant growth provides important sources of food, e.g. aquatic insect larvae which themselves depend on nutrients washing into the estuary, removal of these plants could, perhaps, have a direct effect on nutrition of gobies within the estuary.

Removal of existing shrubs between State Street and Cabrillo Boulevard may alter their microhabitat and behavior of gobies in this region of the creek. A change of this nature may be construed as having an adverse effect on gobies. The effect would also be temporary.

Design plans would leave the creek's channel wide than it is currently and confined between concrete walls whose surfaces are smoother than the existing spectrum of revetments. These structural changes could induce changes to flowing water, especially in the boundary layer where tidewater gobies might swim preferentially. Such potential changes in lotic characteristics of the creek could affect tidewater gobies adversely.

Construction between the oxbow and Canon Perdido Street. As construction during the second year of the project **(Project Description attachment)** resumes upstream of the oxbow and then shifts steadily upstream from there, silt curtains will be deployed below the immediate area of construction to reduce suspended sediments in the water. In all likelihood, these fences probably will not trap all sediments and some will be carried downstream to the estuary. Although the distance over which untrapped sediments would have to travel and probably settle out (a minimum of about 1200 feet between the oxbow and Yanonali Street) before ever reaching the estuary, if concentrations are still high gobies there could have some impairment of respiration. This potential adverse effect should wane as mechanized work advances steadily upstream from the oxbow toward the project's upper limit.

Secondarily, silt fences may also trap potential food items that would otherwise wash downstream and become part of tidewater gobies' diet. A change in movement of organic detritus, also potentially attributable to silt fences located farther upstream, could starve insect larvae or snails which gobies normally feed on, thereby indirectly affecting tidewater gobies. Disruption of the food web in the estuary due to construction upstream which alters the movement of sediment and organic debris downstream may constitute an indirect effect to tidewater gobies in Mission Creek.

Routine channel maintenance. Once finished, the project will require annual maintenance to maintain design channel conveyance **(Project Description attachment)**. Historically, fine sediments have never accumulated in the estuary to a depth which necessitates they be removed. Larger runoffs during the winter months effectively remove all the silty deposits which settle there during the summer and fall. Sediment budgets should not change appreciably with the project (Chapter 5, below). As a result, no impact to tidewater gobies is anticipated from periodic maintenance procedures.

5 HYDRAULIC CONSIDERATIONS ON CONDITIONS IN THE ESTUARY

The proposed designs to accommodate runoff equal to 3400 ft^3/sec through this region of Mission Creek necessitate structural changes of the creek bed and its banks. In turn, these will bring about hydraulic changes when compared to existing conditions. The effects of structural changes — wider streambed, soft bottom of the streambed upstream from Highway 101 and downstream of Yanonali Street, a uniform gradient of that streambed, lower water velocity at any given discharge, a shift of sedimentary deposition upstream from where bedloads now tend to settle, walls to confine the creek channel and keep the banks in place, and a culvert to bypass the oxbow channel — have been analyzed with appropriate numerical models. Results of those models constitute the second attachment to this BA. Interpretations of those results appear below in regard to microhabitat requirements of gobies, typically as representative cross-sectional evaluations. However, these interpretations are not meant to substitute for those numerical results and the reader's attention is directed to that attachment for any and all relevant hydraulic information.

5.2 WIDER CREEK AND CHANNEL.

Greater capacity of the streambed would come, in part, through lateral expansion by excavation of existing stream banks. Expansion of the creek's width would not be uniform throughout its length. Instead, different segments would widened different amounts:

Table 2. Larger streambed as a result of flood control design						
segments bounded by streets	existing creek bed width (average)		planned creek bed width		% increase	
	feet	acreage	feet	acreage	feet	acreage
Canon Perdido to Haley Streets:	25 feet	1.22 acres	43 feet	2.10 acres	75% wider	72% larger
Haley to Gutierrez Streets:	25 feet	0.39 acres	50 feet	0.78 acres	100 % wider	100% larger
Yanonali Street to Cabrillo Boulevard:	27 feet	0.69 acres	60 feet	1.54 acres	71% wider	220% larger
streambed habitat		**2.30 acres**		**4.42 acres**		**92% larger**
net change				**2.12 acres**		

5.3 Natural Bottom.

At present, concrete has been placed on the bottom or along the sides of the creek over at least 33% (1820 linear feet) of the streambed, or as estimated by existing streambed area, on about 20% of that (*ca.* 0.52 acres/2.3 acres = 0.2). Estimates are conservative because more could well be present but unseen because sediments cover it.

All existing hardened bottom would be removed and replaced by native sediments throughout except within the historic sandstone channel and beneath bridges already built as box culverts. In total, approximately 4450 linear feet of streambed would be surfaced with native sediments. Incorporating the three distinct widths of the final design — 43, 50, and 60 feet — the proposed design would yield approximately 4.4 acres streambed, and all this would be without any hardened surfaces, just soft, native sediments. This would amount to an increase of nearly 2⅛ acres over the current size.

The native sediments which underlay Mission Creek would become the actual stream bed after all existing hardened surfaces have been removed. Subsequent aggradation of materials derived from the Santa Ynez Mountains, primarily cobbles and coarse gravels, would restore the bottom's native irregular and varied texture. Together with finer sediments lodged among them, invertebrates and herbaceous plants would benefit incidentally.

5.4 Longitudinal Streambed Profile

The streambed will have a constant pitch when completed, particularly at bridges. No discontinuities in the slope of the creek's channel will occur anywhere within the project, nor at the transition to the trapezoidal section of Mission Creek upstream from Canon Perdido (see Hydraulics attachment). In consequence of this design feature, steelhead will not confront drop structures of any kind from either direction.

5.5 Current velocity

The existing stream channel has considerable topographic variability in addition to being rather narrow on average. The lateral expansion coupled with restoration of soft bottom throughout would have the overall effect of slowing the water at any given discharge. Calculations from appropriate numerical models of the stream channel **(Hydraulics appendix, HEC-RAS output)** were made at 50 foot intervals of measured stations. Among those, seven representative cross-sections have been selected to represent the general pattern. These seven happen also to be the cross-sections for which sediment deposition budgets were calculated, as well. By location, they are shown in Fig. 4.

Table 3. Water velocities as calculated (HEC-RAS model) for seven representative stream cross-sections.

	Velocity (ft/sec) of Mission Creek when conveying 640 ft^3/sec	
representative cross section	existing channel	proposed wider channel
11	4.55	6.88
10	8.14	6.17
9	5.15	3.42
8	10.22	4.68
7	5.57	4.38
6	9.37	4.38
4	1.92	3.89

At two cross-sections, one of them in the estuary (#4), stream velocity is expected to rise compared to existing patterns. Water velocity in the center of the channel would double from about 2 to about 4 feet per sec, according to these calculations. At five of them, stream velocities are projected to be lower than the current conditions.

On average, stream velocity at a discharge equal to 640 ft^3/sec would by 95% of the current conditions.

5.6 Sediment Budget

Stream flow data recorded through the period of record (at USGS stream gage station № 11119750 on Mission Creek near Mission Street, approximately 1½ miles upstream of the top of the project) were analyzed by appropriate statistical techniques (HEC-1 Flood Hydrograph Package, see Hydraulics attachment) to give valid and comparable models of peak and average daily flows. Such numerical models, called balanced hydrographs, then were applied in conjunction with the specific hydrograph of the record flood (that of January 10, 1995 when peak discharge reached 5200 ft^3/sec and the 24 hour average discharge was 1400 ft^3/sec) to calculate projected movement of sediments.

Each calculation (Table 4) pertains to a single storm event, even though the present and future needs to remove sediments arise from net aggradation from the sporadic patterns of individual storms over a period of time. Projections for sediment movement at seven representative cross-sections (Fig. 4) have been derived at three representative levels of discharge. In a harsh year, the sediments from many storms could trigger repeated maintenance cycles within certain reaches of the creek. On the other hand, several mild winter seasons may come and go without need for any maintenance of the streambed.

Table 4. Anticipated pattern of sediment deposition or erosion at seven cross sections on Lower Mission Creek. Results come from numeric modeling of sediments budgets based on balanced, synthetic hydrographs for each of three flow conditions. All results are in units of cubic yards (yd^3) and represent the expectation of sediment movement arising from a single storm event whose peak conveyance corresponds to either the yearly average event for Mission Creek (640 ft^3/sec), a storm event that occurs on average once every 5 years (1470 ft^3/sec), or a storm event that occurs on average once every 20 years (3400 ft^3/sec). Columns headed 'current' and 'designed' show sediment patterns for the existing conditions and the proposed flood control project, respectively. The columns headed 'difference' show how sediment patterns would change as a result of the project.

Cross section	net effect	640 ft^3/sec discharge			1470 ft^3/sec discharge			3400 ft^3/sec discharge		
		current	designed	difference	current	designed	difference	current	designed	difference
# 11	erosion	-333	-1850	**-1517**	-939	-5081	**-4142**	-2683	-14155	**-11471**
# 10	deposition	-820	1348	**2168**	-2075	3691	**5767**	-5305	10251	**15555**
# 9	erosion	252	-297	**-549**	599	-1384	**-1983**	1425	-5862	**-7287**
# 8	deposition	383	483	**100**	1061	1892	**831**	2973	7268	**4294**
# 7	deposition	-1181	185	**1365**	-3237	513	**3750**	-8991	1444	**10434**
# 6	erosion	592	-56	**-648**	1624	-111	**-1736**	4518	-198	**-4715**
# 4	erosion	581	-313	**-895**	1594	-928	**-2522**	4422	-2773	**-7196**
net difference				**25 yd^3**			**-35 yd^3**			**-385 yd^3**

Sedimentary regimes are predicted to change most at cross-sections 10 and 7. In both locations, the current erosive pattern would shift to one of net deposition. The opposite kind of change, from a current depositional pattern to one of net erosion during a storm event, would characterize three cross-sections. For example, storm events would be expected to remove silts and fine sediments from the estuarine section of the creek, cross-section 4. A similar change to net erosion would occur at cross-sections 9 and 6, both upstream of Highway 101.

To the extent cross-section 4, an arbitrarily chosen location, typifies the changes expected throughout the estuary construction of the project would reduce the bedload of fine sediments carried in. The substrate in the estuary may come to have a more gravelly and rocky texture throughout on a permanent basis. If so, tidewater gobies may actually have an expanded spawning area as a result.

The change from existing conditions to design conveyance capacity would alter the net sediment budget for the entire project very slightly. A net total of 25 yd^3 should accumulate each time the creek carries an average storm event. In contrast, individual higher peak flows should promote net erosion from the streambed, 35 yd^3 during a 5-year storm event and roughly ten times that quantity removed during a single design event.

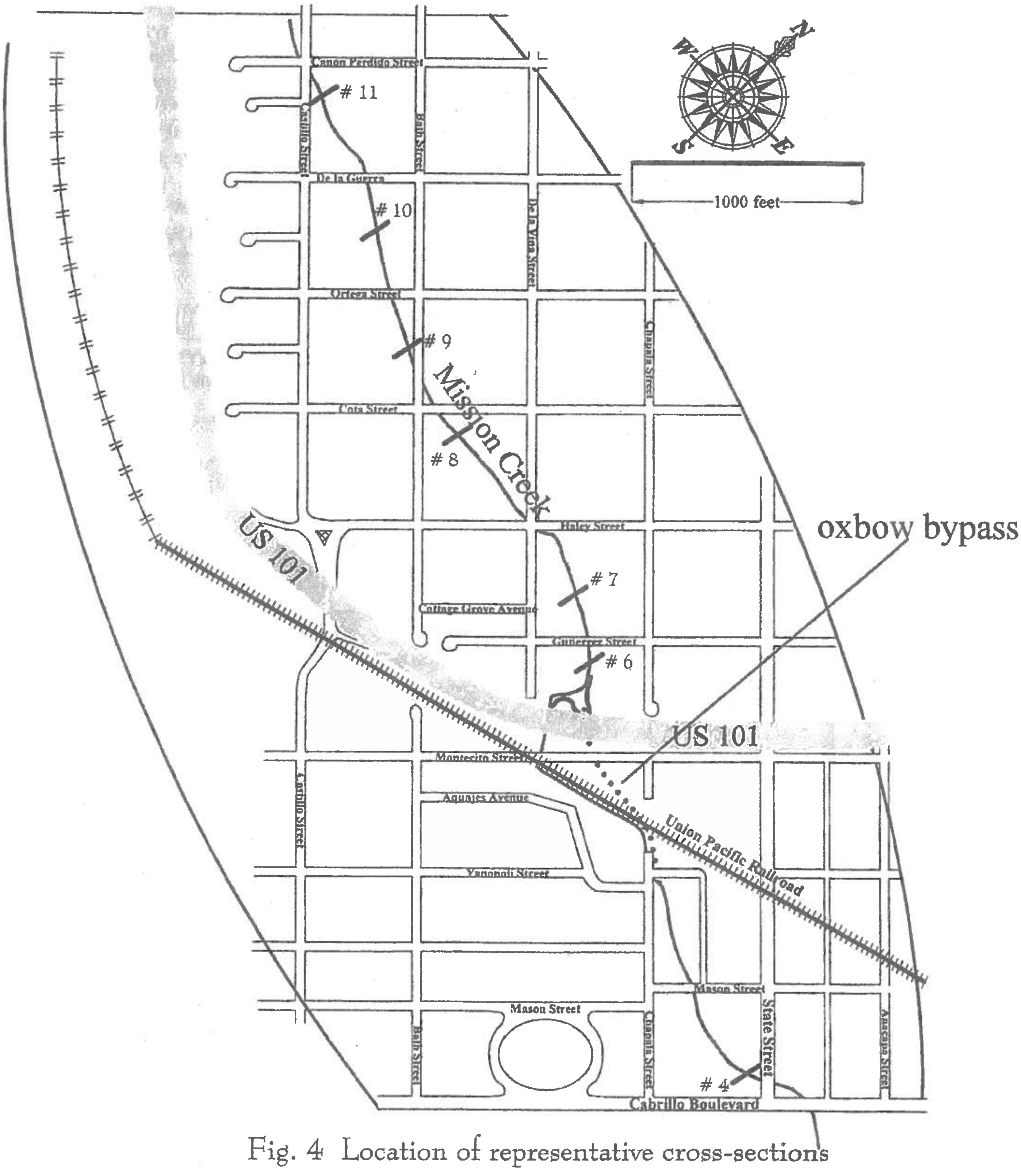


Fig. 4 Location of representative cross-sections

5.7 Toe-Walls and Banks Stabilized by Ungrouted Riprap and Planted with Native Species

Bank stabilization upstream of Highway 101 would rely primarily on slopes armored by riprap. Cylindrical planters placed through the riprap would admit canopy and understory species. The final surface would be hydro-seeded with an appropriate mixture of annual and perennial native grasses. In total, about 3900 linear feet of riprap bank would be created. In nearly all locations, this design creates a plantable corridor slightly more than 11 feet wide, so the proposed project would install just under 1 acre of stream bank corridor.

This bank treatment would be applied mostly upstream of the freeway. It cannot be used where vertical walls must be retained (e.g. left hand bank above De la Guerra Street), or other structural requirements dictate (e.g. nearly all the way below the sandstone channel, except the left hand bank below Yanonali Street).

As illustrated roughly in Fig. 5 poured walls would define the bottom portion of the channel but the bank above those walls would angle outward to the top of the bank. The sloped bank would consist of riprap 15 inches thick, top soil distributed through the interstices of the riprap, and all overlain by 10 inches of prepared topsoil. Native rock and soils as its base would

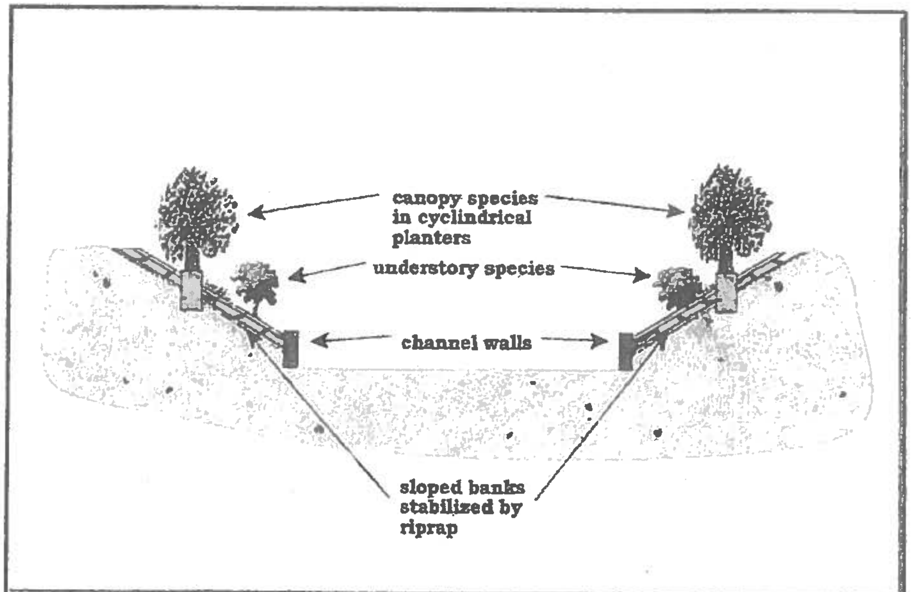


Fig. 5. Very simplified representation of the combined features of the preferred flood control design. It incorporates bank stabilization of riprap planted with native vegetation above low channel walls. It depicts a typical cross section of Mission Creek and suggests the opportunities for restoring the principal native species at the core of a riparian community: canopy species such sycamores, cottonwoods, live oaks, etc; and understory species such as arroyo willow, Mexican elderberry, coyote brush, etc.

accommodate planting riparian trees and shrubs. Large trees would be set out in defined planters which extend through the riprap. Willows would be planted as wattles below the riprap, to sprout through the interstices. Other native shrubs would be planted into the topsoil above the riprap. Appropriate, temporary irrigation would be installed to provide water long enough for plants to become fully established. Details of riprap slope construction, the selection of native plants to be included, their maintenance expectations, and criteria of establishment and growth are presented in the Mitigation Monitoring Plan.

5.8 Box Culvert as Oxbow Bypass

The design capacity, 3400 ft^3/sec and which corresponds to a storm event that occurs once every 20 years on average, requires a means to convey water past the most constricted portion of Lower Mission Creek. That constriction exists at bridges within the oxbow portion of the existing channel. Currently, water spills out first at the Montecito Street Bridge and the railroad bridge immediately downstream of it. The project incorporates a box culvert to carry the bulk of storm events whose discharge exceeds the yearly average event (640 ft^3/sec, a recurrence interval of 2.3 years) as that means.

Originally, the culvert was designed to be 540 feet in length, and would have terminated in the vicinity of Chapala Street by coming through the wall of the sand stone channel. As now modified, the culvert will extend between the upper end of the oxbow and the Yanonali Street Bridge. The culvert and the existing watercourse will reunite immediately below that bridge. Design of this feature will lead all flows equal to or smaller than 640 ft^3/sec through the sandstone diversion channel, i.e. the existing course for Mission Creek. The design will not constrict in any substantive way the route water currently follows through the oxbow and sandstone channel.

When runoffs surpass that volume, the design will begin to divide storm flows into two paths by engaging the bypass culvert at the same time as directing some additional water (in excess of 640 ft^3/sec) to follow the existing path to the ocean. Volumes up to1050 ft^3/sec will be entrained through the oxbow and sandstone channel, just as they currently flow. Simultaneously, the culvert will shunt as much as 2350 ft^3/sec past the existing channel.

6 Structural Features Which Mitigate Temporary Adverse Effects

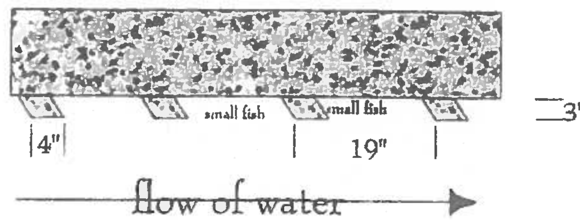
In actuality, a second fish species which is also Federally protected, steelhead (*Oncorhyncus mykiss*) are known to migrate through Mission Creek. Elements of the proposed flood control project intended as compensatory mitigation for incidental but adverse effects to tidewater gobies also apply to steelhead. This species is included hereafter.

All impacts to either fish species would be of temporary nature. The project would not permanently reduce net reproductive rate ($R_0 \approx \int l_x m_x dx$), age-specific survivorship (l_x), age-specific fertility (m_x), or dispersal ability of either species. Incidental take is likely to occur despite environmental commitments described in Chapter 7 however, so mitigation is appropriate. Broadly, these elements would improve habitat conditions for both species. They are summarized in the following table and more detailed descriptions follow that.

Table 5. Structural features which each partially mitigate for adverse effects to steelhead and tidewater goby. Indirect benefits come about by raising the quality of aquatic habitat in the estuary or the riverine portions of the project area.

	direct compensatory benefits		indirect compensatory benefits	
Project feature	steelhead	tidewater goby	in-stream fauna	movement of water
soft bottom	natural sediments create rough surfaces which ease upstream migration	more bottom surface as foraging area	promotes larger invertebrate populations	lower runoff velocities
expanded estuary	larger area where smolts can bide their time just prior to entering the ocean	greater water volume to hide from predators		
ribs on estuary walls		a boundary layer refuge of lower velocity and eddy currents		no reduction of channel conveyance
horizontal ledges on estuary walls	sheltered overhangs as resting places	shelter from predators		no effects on channel conveyance
fish baffles on estuary walls	hiding places for smolts	hiding places	many species prosper in these varied microhabitats	no effects on channel conveyance
in-line and side weir at oxbow	prevents flows from entering culvert when steelhead could be present			divert all flows ≤640 ft^3/sec through existing watercourse
mid-stream boulder clusters	create heterogenous flow regimes and resting pools		varied microhabitat conditions would favor many species	absorb momentum of strong flow regimes
horizontal ledges on riverine walls	sheltered resting spots		promote scour pools where water persists through dry months	no effects on channel conveyance
fish baffles on riverine walls	turbulent and varied flow regimes during migration		varied microhabitat conditions would favor many species	no effects on channel conveyance

Fish refugia in the estuary. Permanent and durable mitigation features to create hiding places where fish may take refuge would be composed from three separate structural elements by forming coarse surface relief of the walls, artificial overhangs projecting from the walls, and placing double rows of coarse boulders between the overhangs along the walls of the estuary. In combination, they should provide shelter for fish of all sizes.



High-relief surface ornamentation where gobies and other small fish could escape strong currents would be made in a pattern of slanted ribs. Each would be molded as a parallelogram to stand 3 inches proud of the wall surface, 4 inches wide, and whose downstream face would form an acute angle to the wall. Nineteen inches would separate one from the next, as illustrated. These molded ridges would extend from the ordinary high water mark to the bottom of the formed wall, roughly eight feet in vertical length. Most of the time water in the estuary would cover them completely and each would extend well below the streambed. Lower velocity and localized eddy currents would exist around these ribs, primarily caused by the effects of protruding ribs on the boundary layer adjacent to the wall itself. Small fish the size of gobies would easily find the recesses on their downstream side and take advantage of the refugia from currents created by these mitigation structures.

The second component of structural mitigation features, these intended primarily for steelhead and other large fish, would consist of projecting ledges. Ledges would jut perpendicularly from the wall 2 feet into the flow, be 6 inches thick, and roughly 50 feet long typically. Within the estuary, jutting ledges would be built at varying heights, say 10 to 20 inches, above the invert of the streambed and substantially below the ordinary high water level. Water would cover these ledges at all except the lowest low tides and all fish could easily swim beneath them.

The space between successive projecting ledges allows a third mitigation measure: boulders of sufficient weight to stay in place against the velocity of design events (approximately 8 ft/sec) (Hydraulics attachment). A double row of large, angular rocks would be nestled together and placed against the wall at the foot of the ribs. Ranks of boulders would extend into the creek about 5 feet from each wall. The innumerable crevices, voids between rocks, and spaces between rocks and the wall itself

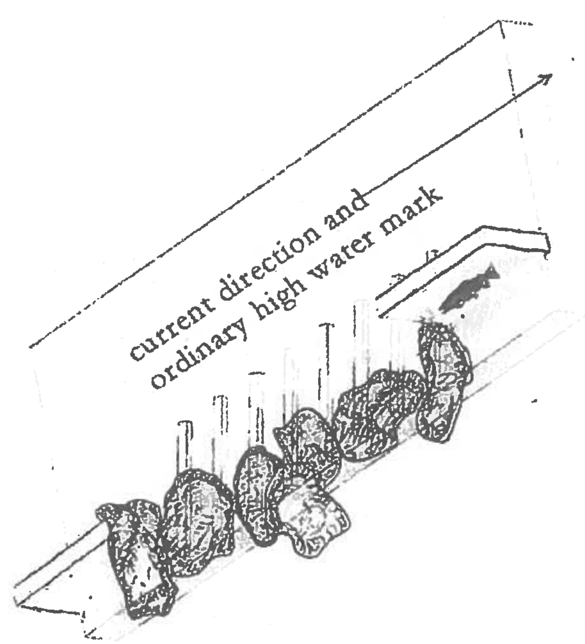


Fig. 6. Ribs, boulders, and ledges within the estuary. The streambed would be about level with the truncated bottom of the wall; not to scale.

formed in this orderly jumble would provide thoroughly natural habitat for small fish and invertebrates. A fraction of those spaces should prove large enough for steelhead smolt also to find shelter amongst the rocks

Ribs, boulders, and ledges would line both sides of the estuary between Cabrillo Boulevard and Mason Street. All surfaces in this section of the project would have all three features intermixed, although a ledge on one wall would face ribs and boulders on the opposite wall (Fig. 6, where ledges are not drawn to scale length). Lengths of the walls allow 380 linear feet of fish ribs and boulders and 240 linear feet of overhanging ledges on the left hand side; 360 linear feet of fish ribs and boulders and about 300 linear feet of ledges on the right-hand side. A more succinct rendering of these three mitigation features together appears in the Preliminary Design Plans attachment, sheet 8.

Locations in the estuarine portion of Mission Creek where ribs, boulders, and ledges would be built are shown in the Project Design attachment, Exhibit 4, sheets 1 and 2.

Underground bypass of oxbow channel. In actuality, the existing watercourse and the culvert must function as paired alternative channels which accomplish two separate needs. First, the existing oxbow must behave as the sole channel for all discharges less than the yearly average event (640 ft^3/sec, a recurrence interval of 2.3 years), i.e. the culvert cannot begin to accept any water until flows exceed 640 ft^3/sec. Secondly, when discharges exceed that threhold the water's momentum must carry it toward the culvert preferentially and away from the oxbow to counteract the existing route's tendency to take on flows in excess of the limiting conveyance capacity, i.e. flows larger than 1050 ft^3/sec must be captured by the culvert. At the design limit, the culvert will shunt as much as 2350 ft^3/sec past the existing channel while 1050 ft^3/sec pass through the oxbow.

This switching hydraulic property of oxbow and culvert can be achieved by construction of a weir which combines both lateral and in-line elements arranged in a direct line with the current and the entrance to the culvert. The plan drawings **(Hydraulics appendix)** depicts its length, width, cross-sectional profile, and combined lateral and in-line characteristics of the surfaces which establish the threshold at which water begins to enter the culvert. Based on numerical solutions **(Hydraulics appendix, HEC-RAS output)**, it would need to be slightly taller than 3 feet to have an operational threshold of 640 ft^3/sec and approximately 240 feet in length to accommodate discharges in excess of 1050 ft^3/sec, the capacity of the oxbow channel. Further refinements of design criteria for the weir could emerge later during the project engineering design phase. Any such refinements would also incorporate recommendations from hydraulic evaluations by FWS itself.

The lateral portion of the weir complex which would extend toward the Gutierrez Street Bridge would occupy about 22 feet (to the outer side of the structure) of the finished design width of the stream bed itself, 50 feet wide **(Preliminary Design Plans attachment, sheet 9)**. The difference, about 28 feet, would be creek bed with natural bottom. The existing stream bed along this specific portion of the creek tapers over a distance of about 125 feet from 35 feet wide (10.8 m as measured May 4th 2000) immediately below Gutierrez Street to about 22 feet. In the next 75 feet it widens again to approximately 27 feet. Thus, construction of the side portion of the weir can be achieved with no restriction compared to the existing streambed width. Water velocities adjacent to the weir are projected to range between 4.39 and 1.88 ft/sec at a discharge equal to 640 ft^3/sec (Hydraulics appendix, HEC-RAS output). The existing streambed passes through this constricted point at more than twice that, 9.37 ft/sec. Since the soft-bottom portion of the creek would be wider than the existing conditions than with the lateral weir in place, the weir would not increase water velocities through this region of the creek; before water starts to pass over the weir. Indeed, water velocities between Gutierrerz Street and the start of the oxbow should be substantially lower than occur now.

The downstream end of the culvert would be at grade level, and the streambed here armored by riprap to prevent scour below the culvert. Before the controlling weir begins to pass water into the culvert and thus create a current through it, flows down the existing channel will back up into the culvert from the bottom and create a static pool of variable length depending on the discharge at the time.

Mid-stream boulder clusters. Baffle structures the full width of the streambed and 300 feet in length would combine clusters of large boulders and fields of riprap at two locations, the two separated by about 2350 linear feet of streambed (**Project Design attachment, Exhibit 4, sheets 3 and 5**).

Stone used for riprap would be as large as15 inches in diameter and of angular character. Larger boulders, essentially individual derrick stones of 3 to 4 feet diameter each, would be set down into the surrounding riprap, placed 5 to 8 feet apart, and arranged in clusters of 6 to 9 individual boulders. Tips of the rocks would protrude 1½ to 2 feet above the streambed (**Preliminary Design Plans, sheet 6**).

The boulder patches would constitute islands of very coarse and permanent streambed irregularities. Upstream of them, Mission Creek would tend to flow as a homogenous, single current. By their placement, these clusters ought to disrupt that flow regime and induce smaller and intertwined subcurrents. These many smaller currents should continually reshape the longitudinal profile over the length of the baffles fields and downstream of them for some way.

Each cluster of boulders would naturally form various internal cross currents and protected patches of water. Placement of clusters within the baffle field (**Project Design attachment, Exhibit 4, sheets 3 and 5**) is intended to promote the variety of water conditions trout seek out in natural streams, so clusters would be placed to outline a sinuous and meandering predominant channel, one that shifts back and forth across the streambed.

Ledges upstream of Mason Street. Overhangs of like design would be placed along the riverine sections of the creek (including the length between Mason and Yanonali Streets, otherwise treated as the upper end of the estuary) where currents should impinge against the wall and scour persistent holes under these ledges. Adult steelhead would have access to these pools during upstream migration. All manner of aquatic animals would take advantage of these sheltered pools throughout the dry season.

Walls on both sides of the creek would have them, placed as indicated by current patterns (**Project Design attachment, Exhibit 4, sheets 2, 4, and 5**). Four would be built along the left hand side (approximately 200 linear feet, in total) and five constructed against the right hand side (total of 250 feet in length).

Fish baffles upstream of Mason Street. Arrays of large boulders placed to the inside of walls would impart diverse flow patterns and a valuable measure of aquatic heterogeneity, lacking which the creek's streambed would mostly resemble an unrelentingly flat surface characterized by steady sheet flows. Their mass and position adjacent to the wall, and thereby within the boundary currents inherent to sides of the channel, would minimize the incidence of currents dislodging them.

Each baffle would consist of a rank of large rocks or derrick stone placed touching the inside surface of the walls, with a second rank inside the first and closer to the creek. Rocks would stand proud of the streambed by 18 to 24 inches. Together, the two ranks would extend inward toward the creek approximately 5 feet. A space of 5 to 8 feet would separate individual rocks, or perhaps pairs of boulders, to facilitate periodic removal of sediments from between them.

Fish baffles would occupy locations in lower velocity sections of the creek, on one side or the other as appropriate to its curvature. In certain lengths of the creek side baffles would be placed along one side only, then for another length be built against the opposite side. Many baffles would extend along 150 feet of the creek's side, a few up to 200 feet in length, while others would be shorter by necessity. Design restrictions prevent their placement beneath bridges, for a certain distance on the upstream side of bridge abutments, and directly opposite other baffles or ledges.

The creek's channel allows fish baffles to be interspersed with ledges as indicated by the prevailing direction of currents and streambed to encourage formation of varied stream features **(Project Design attachment, Exhibit 4, sheets 2, 4, and 5)**. Side baffles would be installed over approximately 1400 linear feet of the stream's edge; 675 linear feet of fish baffles on the left and 725 linear feet on the right side.

7 Environmental Commitments to Minimize Temporary Adverse Construction Effects

Spawning by tidewater gobies peaks in March and April (Roberts, 2000). They construct egg clutches in gravely substrates, such as that found in the tidal lagoon below Cabrillo Boulevard. Gobies would be expected sporadically in the estuary through summer and fall, but are unlikely ever to swim upstream of Yanonali Street, primarily because a low sill spans the full creek bed at that bridge where water is quite shallow after the rainy season, and secondarily because gobies prefer more saline waters compared to the flow issuing from the sandstone channel consists which entirely of fresh water.

Measures to lessen impacts to both fish species during streambed, toe-wall, and side slope construction would differ from those applicable during annual maintenance. All are inherently geared to the two species' respective behavior which leads to spawning in their respectively different habitats. Some measures appropriate to construction needs in the estuary (where construction would begin) are not appropriate farther upstream, so they are set out here as though in two separate regions. Work in the estuary will necessitate drying half of it at a time, from the center line to one bank, then switching sides for the opposite bank. A temporary construction exclosure is the preferred method for this requirement. While one half the estuary has thus been dried, normal tidal flush and flows regimes of the dry season can still pass through other half. At no time would the complete streambed be dammed. Work from the oxbow up will necessitate temporary diversion of lower flows. The least injurious method entails placement of a buried culvert into a suitable pilot channel and fitting its intake with appropriate fish barriers, and continuous monitoring.

Construction between Cabrillo Boulevard and Yanonali Street:

1. No construction work in water anywhere in the estuary from mid-December to mid- June;
2. divide a suitable length of the estuary down the middle with an impermeable barrier, perhaps sheet piling. That length should be as long as practicable to minimize repetition of this divide and dry procedure for making temporary construction exclosures. A lateral coffer dam in mid-stream shall not be acceptable because of increased turbidity and fine sediments that would conveyed downstream to the coastal lagoon;
3. Dam half the estuary at the upper end of the center-line barrier with sheet piling;
4. Qualified biologists walk downstream in zigzag pattern to herd as many fish as possible from the incipient exclosure;
5. Dam the lower end of the exclosure with sheet piling immediately;
6. Fish biologists seine the entire confined half thoroughly to remove any gobies and other large organisms to the estuarine water flowing by outside the construction exclosure;
7. Commence pumping water from the exclosure with intakes to pump fitted with ½ mesh screens;
8. Fish biologists monitor drying exclosure and seine it thoroughly at least twice a week;
9. When construction on one side has been complete, the downstream wall of the exclosure shall be removed first, followed by the upstream end;
10. Repetition of the steps above on the opposite bank .

Construction between Highway 101 and Canon Perdido Street:

11. No mechanized equipment permitted in water between December 15 and the end of March;
12. Prior to starting work in the next region upstream, a qualified biologist would examine all scour pools at bridge abutments, undercut concrete ledges, etc.;
13. Any steelhead, or young salmonid fish in particular, found unexpectedly in these small refuges would be relocated upstream to a receiving area previously identified and agreed upon by FWS and CDFG and in a manner thoroughly consistent with appropriate transportation techniques. If authorized, the monitor shall weigh, measure, remove a sample of cheek scales, remove a sample of adipose fin, and apply a permanent identification tag of acceptable properties to each salmonid discovered and relocated;
14. The biological monitor shall prepare a written report giving all pertinent details of fish relocated;
15. Silt curtains shall be deployed below the immediate area of construction. Curtains would be deployed in pairs, with a gap at least 30 feet wide between the upstream and the downstream curtain to reduce suspended sediments in the water;
16. A temporary net of appropriate size as agreed upon by FWS and CDFG shall be strung across the existing low flow channel to prevent salmonids from entering the section of creek next to be constructed;
17. Once certified free of protected fish, the existing current would be diverted to a temporary pilot channel shall be scored in the center of the creekbed;
18. As many culvert pipes as determined necessary to carry anticipated low flows shall be placed into the pilot channel. A mesh filter no larger than ½ inch square shall cover the intake. Culverts shall be at least 24 inches in diameter. Culverts shall not be longer than 100 yards;

19. Once culverts have been placed, the biologist shall monitor each section at least twice a week to verify that screens are in place over intakes and water has not leaked into the local section under construction;
20. Prior to completion of work in a given section, the temporary net shall be resuspended upstream of the culvert intake and fully across the existing low flow channel;
21. Only then shall removal of the culvert and completion of the natural streambed downstream be allowed;
22. The pair of silt curtains shall be removed;
23. The next upstream segment of creek bed and banks shall be readied in like manner.

8 Environmental Commitments to Minimize Recurrent Adverse Effects During Future Channel Maintenance

8.1 Routine Maintenance Upstream of the Oxbow

Above Highway 101, a biennial cycle of maintenance activities shall be instituted which incorporates a mosaic pattern of sediment removal from half the creek's bottom and mechanical brushing of vegetation in the other half each year, then repeating the process in the other half the following year. Debris reducing the channel's capacity would thus be removed from half of it in any given year. Mechanized equipment would be used in the creek bed to restore conveyance capacity, and the maintenance procedures would emphasize partial retention of aquatic habitat conditions (**Preliminary Design Plans, sheet 1, typical cross-sections**). Appropriate measures for:

Regular de-silting and brushing of vegetation in the creek bed —

24. All routine maintenance shall be accomplished between August and mid-October;
25. A pair of silt curtain fences shall be set across the low flow not more than 100 yards downstream of the work area;
26. the fences shall be approximately 10 yards apart;
27. A qualified biologist would examine all pools at bridge abutments for young salmonids;
28. Any trout present shall be captured by techniques dictated by National Marine Fisheries Service and California Fish and Game and relocated promptly to a suitable refuge;
29. A written report describing in detail any such relocations would be submitted to National Marine Fisheries Service;
30. Mechanized equipment would enter the creek via the access way at the parking lot of the church at Canon Perdido Street, that at Cota Street, or that immediately adjacent to the oxbow;
31. A front end loader or road grader working together with dump trucks (10 yd^3) would be used for the bulk of sediment and vegetation removal;
32. A swath half the channel wide shall then be cleaned, first along one side as seems convenient for an arbitrary distance (say, 250 feet), then switching to the opposite bank for another arbitrary distance;
33. the half of the streambed from which sediments are removed shall be completed by scoring a pilot channel as close as practical to the side baffles or ledges without hitting them and chamfer that dressed side gently from the center line to the pilot channel;
34. the pilot channel would routinely head toward and pass close to projecting ledges to keep water flowing in their general direction during the dry season;

35. vegetation in the other half shall be mowed to suppress the growth of woody perennials but still allow herbaceous perennials and annuals to grow;

36. If storm events of the next winter rains leave enough sediments to warrant their removal, then during the following summer the other half of the creek bed, that where only brushing of plants occurred the previous year, would be groomed to remove obstructing sediments and plants, and to shift the chamfer and the pilot channel to the opposite side;

37. If storm events do not reduce conveyance more than 15% then the next maintenance cycle shall involve only mowing of vegetation

for maintenance of side baffles, ledges, and mid-stream boulder clusters —

38. Sediments would be removed from among boulder clusters and large rocks of the side baffles only as needed to prevent them from being covered completely;

39. If necessary, sediments shall be dug from the downstream side of boulders with a backhoe equipped with a 3 foot bucket, then dragged toward the center of the creek to be combined with streambed sediments being removed as described previously;

40. any individual boulders that might have been dislodged mechanically or displaced by currents would be pushed back into a suitable vacant spot in the baffle and reset.

41. Any propagules of giant reed or salt cedar that have taken root shall be eliminated. A combination of foliar application of glyphosphate or digging out rhyzomes with hand tools could be employed. Application of herbicides should be very limited, confined to only those small locations where the most persistent and aggressive weedy plants begin to re-invade the creek bottom;

42. The remaining growth shall be cut back using a brush hog, or similar mowing attachment passed a couple feet over the tops of the rocks. The intent is to cut down woody species before they attain much height or stem expansion, but not to eradicate low-growing herbaceous plants that offer negligible friction to water currents.

8.2 Maintenance Expectations Between the Oxbow and Sandstone Channel

The weir's height would push all flows smaller than 640 ft^3/sec toward and through the sandstone channel. In effect, the pattern by which sediments currently settle in the sandstone channel would remain unchanged.

Removal of silts and vegetation between the Highway 101 bridge and through the sandstone channel would continue to follow current practices.

- Sediments and vegetation would be removed when channel capacity has been reduced by more than 15%;
- All routine maintenance shall be accomplished between August and mid-October;
- A qualified biologist would examine all pools at bridge abutments for young trout;
- Any trout present shall be captured by techniques dictated by National Marine Fisheries Service and California Fish and Game and relocated promptly to a suitable refuge;
- A double line of straw bales or silt curtain shall be set across the lower end of the channel;
- A front-end loader would scoop all materials directly from the channel to trucks waiting above adjacent to the railroad tracks;
- The full width, 33 feet, would be cleaned of obstructive materials.

8.3 Maintenance expectations Within the Estuary

Projections of sediment transport indicate greater erosion from storm events than currently takes place. During storms, water entering the culvert would carry less sediment than it could by virtue of the blocking effect of the weir. When flows through the culvert and sandstone channel converge, this volume of cleaner water would resuspend fine sediments. Hence, the net effect of the project within the estuary should shift the composition of the streambed to gravels and small rocks, rather than fine silty sediments. Removal of silty materials or other fine sediments from anywhere in the estuary should not become a maintenance requirement of the project.

9 CONCLUSIONS

The Corps of Engineers analyzed thoroughly the potential for impacts to tidewater gobies which implementation of the proposed flood control project could cause. The possible need to relocate them out of harm's way during construction, in a manner supervised and approved by the US Fish and Wildlife Service would constitute an unavoidable impact. Recognizing that, the Corps developed all feasible measures of mitigation in coordination with FWS and other concerned resource agencies.

The proposed action will result in temporary degradation of habitat and ecological resources found associated with the estuary and important to the life cycle of tidewater gobies. At the completion of construction work, late in the fall of the first year of the schedule, between Cabrillo Boulevard and Yanonali Street those temporary effects would have been overcome by the larger estuary (more than double in existing surface area) and the assorted refugia to provide hideouts for fish.

Water should move through this final portion of Mission Creek at similar velocities as occur presently because the creek bed would be both wider throughout and have a soft bottom of natural materials. Sediment deposition and erosion would differ only marginally from existing patterns. The substrate in the estuary should become coarser with more gravelly places than now.

Measures to reduce the impact to tidewater gobies include relocation of individuals by a knowledgeable and qualified biologist. Together, all measures should avoid long-term and permanent adverse effects to this population of tidewater gobies. The proposed scheduling commitments and monitoring would minimize any short-term potential effects.

The design and implementation of this proposed flood control project can be accomplished with only minimal adverse and temporary effects to tidewater gobies. The Corps anticipates design features and structural mitigation features should actually improve microhabitat conditions for gobies in Mission Creek's estuary.

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APPENDIX - A-2

REVISED BIOLOGICAL ASSESSMENT
STEELHEAD
LOWER MISSION CREEK FLOOD CONTROL PROJECT
SANTA BARBARA, CALIFORNIA

PREPARED BY

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

JUNE 2000

BIOLOGICAL ASSESSMENT
pertaining to

STEELHEAD (*Oncorhynchus mykiss*), LOWER MISSION CREEK FLOOD CONTROL PROJECT, SANTA BARBARA, CALIFORNIA

1. INTRODUCTION

The US Army Corps of Engineers (the Corps) prepared this revised Biological Assessment (BA) to comply with the Endangered Species Act of 1973, as amended (the Act). The Corps previously submitted a BA to the National Marine Fisheries Service (NMFS) with the Draft EIS/EIR in December 1999 for the proposed Lower Mission Creek flood control project in Santa Barbara, California. Since the release of the Draft EIS/EIR the project design has been modified to accommodate numerous changes. These modifications include: extension of the bypass culvert from 540 to 830 feet in length and a change in size and orientation of a weir to control the movement of water into the culvert. The Project Description attachment presents a thoroughly detailed project description. These modifications resulted in changes of our analysis of impacts and mitigation measures identified in the Draft EIS/EIR and initial BA. The Corps coordinated extensively with your office staff and other involved resource agencies in development of the project design and hydrological analyses. This revised BA includes detailed biological and hydraulic evaluations and mitigation measures.

Two Federally listed species, steelhead and tidewater goby, occur in Mission Creek. Two separate BA have been written to identify project related impacts, implementation of environmental commitments to minimize or avoid impacts to these species, and implementation of compensatory mitigation for impacts which may nonetheless occur to these species because of this proposed action. The BA for steelhead would be submitted to NMFS, because that agency has authority to ensure that marine resources would not be jeopardized by implementation of the project.

1.1 LIMITING FLOOD DAMAGES ON LOWER MISSION CREEK

The US Congress originally authorized feasibility analyses of various alternatives to curtail Mission Creek's tendency to flood as a Water Resources Development Authorization in 1962. The plan which the Corps devised to accomplish that Congressional directive would reduce flood damages and partially redress historical deterioration of riparian habitat within the project's limits (Corps, 1999).

As proposed, the final portion of the existing stream channel, between Canon Perdido Street and Cabrillo Boulevard, would be widened to accommodate greater peak discharge, 3400 ft^3/sec, than this last section of Mission Creek presently conveys, about1050 ft^3/sec. In addition, an underground culvert designed to take on water in flows greater than 640 ft^3/sec would carry about ⅔ of the creek's conveyance past the narrowest place in the existing watercourse, a constriction in the so-called oxbow channel. Greater width of the streambed would come through excavation of existing stream banks. Except through the oxbow channel, it would have a natural bottom. It would be maintained regularly to preserve the operational characteristics of its design.

The streambed would be confined between vertical walls built in most places to half the height of the existing bank tops, on average between 3 and 6 feet. Those walls at the toe of the banks would constrain the currents, define the ordinary high water level somewhere up their sides, and form the load-bearing support to keep the upper part of the new banks in place. The banks exposed above the toe walls would be planted with native species of canopy and understory plants adapted to stream side habitat in southern coastal California. The Project Description enclosure, attached, presents all details of projection description.

1.2 Participants in Flood Control Project

The Corps is the lead Federal agency. Santa Barbara County Flood Control and Water Conservation District is the direct co-sponsor of the proposed action. In addition, an agreement was struck between the Flood Control District and the City of Santa Barbara. These two entities would share the non-Federal cost of the project.

1.3 STEELHEAD (*Oncorhynchus mykiss*) IN MISSION CREEK

Mission Creek was evidently one of a limited number of suitable streams located south of the Santa Ynez River where in times past young fish swam to sea and adult fish returned to upper reaches as allowed by the runoff conditions of southern California's climatic irregularities (Cardenas, personal communication, 1998; Spina, personal communication, 1998; Trautwein, personal communication, 1997). Historic changes to watersheds and the riparian communities along streams which followed the settlements of and expansion throughout coastal California by Europeans, and were brought about by their systematic institution of agrarian economies, quickly degraded steelhead streams such as Mission Creek to greater or lesser extent. Urbanization continued that degradation. Nonetheless, it remains among the coastal streams of southern California considered by the National Marine Fisheries Service (NMFS) as a significant migratory corridor for steelhead when that agency designated the population of steelhead resident in the coastal waters of southern California an Evolutionarily Significant Unit (ESU) and listed the species as endangered (National Marine Fisheries Service, 1997). The California Department of Fish and Game concurs, reckoning Mission Creek as affording irregular but genetically vital opportunities for adult steelhead to reach upstream spawning beds during the winter months in small numbers (Cardenas, 1998).

The sporadic records of large salmonid fish in the Mission Creek watershed has been the source of differing opinions about its contemporary importance in the life history of steelhead. For example, eleven years elapsed between documented sightings, 1984 to 1995, yet since the spring of 1998 many observations have been reported. The following summaries are indicative of the seemingly irregular appearance of steelhead in Mission Creek:

1984 — Small trout feeding near the Museum of Natural History in early June were identified by a specialist in marine mammals as steelhead (Santa Barbara News-Press, June 3, 1984);

April to June, 1995 — Part of the reconnaissance phase study which the Corps completed in 1995 sought definitive evidence regarding steelhead in Mission Creek. Systematic live trapping for salmonid fishes in Mission Creek did not detect migratory smolts in fish traps erected between Haley and Gutierrez Streets between April 26 and June 6, 1995. Electroshocking all the likely runs and riffles upstream from that location between April 26 and May 16, 1995 also did not disclose salmonid fish with the phenotypic traits of steelhead (Corps of Engineers, 1995). In total, eight trout were captured throughout the watershed, one near Oak Park and the other seven in Rattlesnake Creek, above its confluence with Mission Creek. Without exception, these fish each had all the features of resident, non-migratory rainbow trout (also recognized taxonomically as *Oncorhynchus mykiss*), were the size of rainbow (average length = 190 mm {about 7½ inches}, standard deviation = 29.6 mm), and all but one were judged by analysis of scales to be nearly two years old. The single largest fish was more than two years old. Trout of this age, if they were steelhead, would ordinarily exhibit all the changes of appearance that identify them as steelhead smolt. Absence of these features indicates these eight would never display distinctive steelhead attributes;

May 24, 1995 — A single fish between 12 and 13 inches in length and described as having the "hooked lower jaw" reminiscent of steelhead was landed with a barbless fly from a run in Rattlesnake Creek. The fish was photographed, but an effort tc take scale samples from it was fruitless (Trautwein, letters, 1995a, 1995b). "Additionally, two fish measuring an estimated 12" each were observed in a pool approximately 100 yards upstream from the site where the largest fish was captured." Other trout seen in nearby pools the same date were of the size range reported by the Corps' study, and thus could plausibly be resident and non-migratory rainbow trout;

1998 and1999 — Following the heavy runoff from El Niño rains in the spring of 1998, numerous large fish were reported at several locations above Oak Park in the fall of 1998. Knowledgeable ichthyologists were convinced by the body length, body depth at the pectoral fins, color patterns, and general behavior that these salmonids could not be anything other than steelhead (Cardenas, 1998; Johnson, 1999; Greenwald, 1999). By late June of 1999 very small fish were seen to accompany these larger adults in some of the larger pools near the Museum of Natural History (see accompanying letter) and upstream from there as far as the confluence of Mission and Rattlesnake Creeks (Johnson, 1999). To date, no genetic data has been obtained from any of these fish. Therefore, they cannot be declared definitively as from the southern evolutionary genotypic stocks;

2000 — A female 23 inches in length and a male 27 inches long were documented spawning in poor water and substrate conditions between de la Guerra and Ortega Streets on March 14th. The female made at least three clutches of eggs. The male was seen to fertilize one of them. Later in March, approximately 100 salmonids of the size typical of smolt were seen repeatedly in pools in Oak Park. They seemingly decamped after heavy rains in April, but no observations of them swimming to the ocean have been reported. Two salmonids, also of typical size to be smolt, were observed in salt water below the Mason Street bridge on the 4th of May (Moeur, 2000, field records).

That some among these fish seen over the last 15 years are steelhead, and therefore that Mission Creek has the potential still to provide suitable habitat conditions in some locations, seems no longer a debatable assertion.

Irregular appearance in coastal California streams seems to be a widespread trait within this part of the species' range. Steelhead belonging to the southern evolutionary population appear rather opportunistic in their migratory behavior, both in the number of individuals who make the ascent in any given year — in fact, years when none are seen anywhere in the creek are not uncommon — and the time of year when they enter the watershed. River flow seems to be the factor which most clearly prompts adults fish to try to reach spawning areas in southern California coastal streams. Since the quirks of winter storm patterns in this region cause quite unpredictable flow patterns from one year to the next, their migratory tendencies are controlled by this climatically irregular but annual phenomenon (Cardenas, 1998).

Rainfall data for the last 18 years are indicative of the variability in climate in the watershed of Mission Creek. Between October 1983 and May 2000, average total rainfall measured at the Santa Barbara Sanitation Station has equaled 19.94 inches. In this Mediterranean climate, very little of that rain comes between May and October, as shown by monthly average totals in Table 1 (following page). Nearly two thirds of the total annual rain falls in January, February, and March.

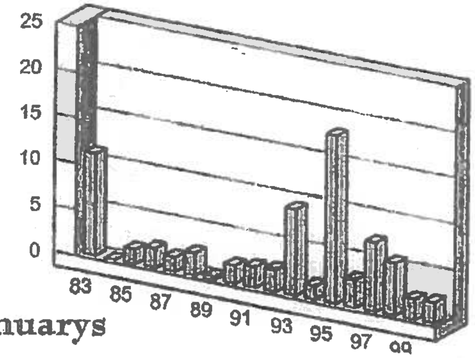
Three accompanying graphs show total rainfall measured in January and February for each year between 1983 and 2000. In a general way, these records show the rather erratic nature of rainfall in each of these three months from one year to the next. For example, the very heavy rains in January 1995 (about 18 inches in that month alone) were markedly greater than January of 1994, less than 2 inches, and virtually no rain fell in February of 1997 but a year later February total rainfall was greater than 20 inches. In fact, February, January, and March have the largest variability in monthly rainfall total, as shown by standard deviations of 5.09, 4.63, and 3.06, respectively.

The inconsistency between years is often matched by inconsistency between successive months within one rainy season, e.g. the 18 inches of January 1995 were followed by scant rains in February (less than 2 inches), and moderate amounts again in March (about 8 inches, total). As another example, the most recent year of El Niño climatic patterns, 1998, brought about 2½ in January, close to 21 inches in February, and only about 4 inches in March.

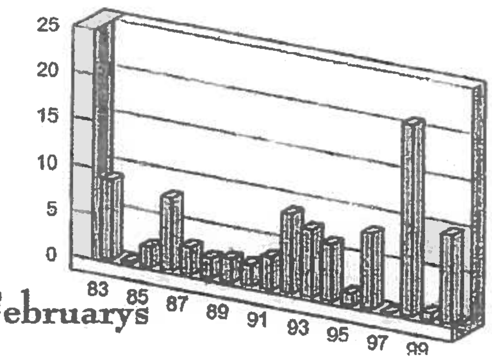
Steelhead from this region have inherited the tendency to migrate streams in this region sometime between January and the end of March, but only sporadically from one year to the next in response to the rather fickle patterns of rain during those three months. The inconstant nature of coastal streams such as Mission Creek may well have selected against behavioral tendencies to migrate annually and without fail to spawning beds in the upper portions of the water shed when climatic conditions were not reliable enough from one year to the next to count on be able to reach those beds.

Table 1. Monthly rainfall in Santa Barbara, October 1983 to May 2000.
(Source:California Data Exchange Center; http://cdec.water.ca.gov/cgi-progs/staMeta?station-Id=SBR)

Month	average total (inches)	observed range (inches)	standard deviation	% of total average annual rainfall
Jan	4.18	0 - 18.2	4.63	20.95%
Feb	5.34	0.07 - 20.86	5.09	26.79%
Mar	3.37	0 - 11.05	3.06	16.87%
Apr	1.17	0 - 4.45	1.59	5.89%
May	0.35	0 - 2.76	0.66	1.75%
Jun	0.11	0 - 0.71	0.21	0.57%
Jul	0.05	0 - 0.52	0.13	0.24%
Aug	0.11	0 - 1.48	0.36	0.56%
Sep	0.39	0 - 3.66	0.92	1.97%
Oct	0.54	0 - 3.02	0.85	2.71%
Nov	1.68	0 - 4.64	1.39	8.40%
Dec	2.65	0 - 7.07	2.25	13.30%



Januarys



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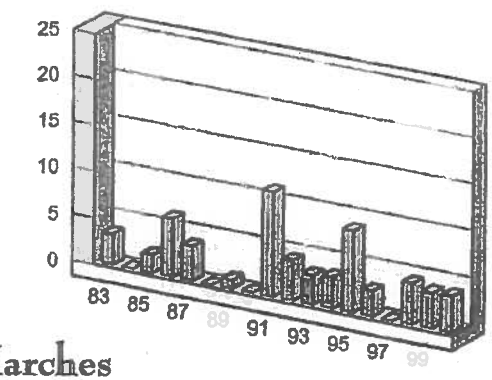

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Table 1 and Figs. 1a, b, & c both pertain to precipitation records in Santa Barbara, from October 1983 through May 2000.

1.4 Critical Habitat

Critical habitat for steelhead (National Marine Fisheries Service, 1999a) evidently includes Mission Creek, although detailed maps and watershed descriptions are not available for inclusion in this BA. NMFS identified hydrologic units containing critical habitat for southern California steelhead and that called Santa Barbara Coastal (hydrologic unit No. 18060013) encompasses Mission Creek. In and of itself, this designation would require implementation of the flood control project in a way so as not to "appreciably diminish the value of critical habitat for both the survival and recovery" of steelhead, and consultation with NMFS under Section 7 of the Act.

2 Interagency Consultation

Section 7(a)(3) of the Act requires active consultation between the lead Federal agency and NMFS in any circumstance in which the lead agency concludes that its proposed action could affect an endangered or a threatened species. Direct effects and indirect effects must both be evaluated. In December 1999, the Corps initiated formal Section 7 Consultation. During preparation of the Draft EIS/EIR extensive coordination occurred between Corps and NMFS staff including reciprocal exchanges of information, discussions of habitat requirements, techniques of field observation, schemes to minimize influences on species while still accomplishing the stated purpose of the proposed project, cooperative site visits, exchanges of written ideas and information, fulfillment of requirements under other pertinent laws, and so forth. The Corps and NMFS have been engaged in such a dialogue since December 1997. Biologists from both agencies have together walked the entire length of the proposed flood control project to evaluate streambed conditions, general habitat of creek and banks, and importance of the lower reaches of Mission Creek as potential spawning or nursery habitat.

The Act requires formal consultation when the agencies determine that a proposed action "may affect" a species listed under and protected by the Act or habitat critical to the species' continued survival. The lead agency initiates formal Section 7 Consultation with a written request, which includes a Biological Assessment, to NMFS [Section 7(a)(2) of the Act] and concludes when NMFS issues a written Biological Opinion [Section 7(a)(3) of the Act].

The Corps submitted a Draft Biological Assessment to NMFS in December 1999. Since then, refinements of hydraulic calculations, sediment budgets, and design features have been under way. Those various supplements are included as separate enclosures which accompany this revised BA. The first of them is the complete and detailed Project Description. The second is the Final Hydraulics Documentation (Hydraulics appendix). The third enclosure consists of Preliminary Design Plans. The fourth enclosure is an independent analysis of shading patterns predicted from the arrangement of trees and shrubs to be planted as part of the project (the Shading appendix). The fifth and final enclosure is the Mitigation Monitoring Plan, which comes directly from Appendix H of the Draft EIS/EIR.

Based on this revised analysis and undisputable observations of steelhead within the project's limits since December 1999, the Corps re-initiates formal Section 7 Consultation with the National Marine Fisheries Service because the proposed flood control project may affect steelhead.

3. EXISTING CONDITIONS

Estuarine and riverine aquatic conditions occur within the area of the project and both portions of the creek have extensive urban influences. The proposed flood control project would necessitate construction in both portions. Adults steelhead must enter the creek through the estuary then transit the riverine portion of the creek. Any young steelhead spawned in the upper waters would do the reverse when of an age to swim to the ocean.

The descriptions which follow treat steelhead as an inhabitant of the creek's aquatic habitat, describe how changes of the streambed, sedimentary regime, and subsequent requirements for streambed maintenance would affect that aquatic habitat, and finally how changes to the existing vegetation on the creek's banks would improve water conditions in the creek's bed directly and indirectly improve migratory habitat for the length of the project. Overall and after maturation of native plants to be included, the proposed flood control project would have greater biological values when compared to the expectations of future conditions in the absence of this project.

3.1 AQUATIC HABITAT

As best Lower Mission Creek may be characterized, its aquatic habitat equates, roughly, to prevailing conditions below the ordinary high water mark, which over the actual length of the streambed included within this project (5380 linear feet) passes from fresh water at its upper end to saline at the lower end. Fresh water in character from Canon Perdido Street to Yanonali Street, 4320 linear feet (80% of the project length), Mission Creek is just barely a perennial stream however. Indeed, urban runoff alone may prevent the disappearance of surface water after late summer. Estuarine traits prevail over the creek's last 1060 linear feet to Cabrillo Boulevard (20% of the project length); becoming more pronounced since the daily interchange of fresh and salt water is greater closer to Cabrillo Boulevard. Commercial and residential development which took place historically along this last section of creek now constrain it within a nearly artificial channel: no mudflats dissected by tidal creeks remain anywhere along the estuary. No tracheophyte plant species ecologically associated with functional coastal marine communities remain anywhere along Mission Creek.

A sequence of man-made structures form a substantial portion of the existing watercourse through which steelhead have to pass. This section probably follows the naturally incised channel although that is not now evident. Mission Creek first bends to the right just above Highway 101, creating a feature known locally as the oxbow. In very quick succession thereafter, the oxbow leads water beneath the freeway (a box culvert bridge 140 feet wide), through a 60 foot length lined by riprap and wing walls, beneath Montecito Street (also a box culvert bridge, 60 feet wide), through a 20 foot section lined again by wing walls, beneath the bridge which elevates the railroad tracks (a central pillar bridge 70 feet wide), and then bends back to the left at the upper end of the historic sandstone-lined channel. The sandstone channel has a concrete bottom and carries water as far as the bridge at Yanonali Street (about 530 in length). The transition from fresh to brackish water effectively begins directly beneath the Yanonali bridge where a sill roughly 15 inches high spans the full width of the creek bed (entirely concrete at that point) and marks the upper limit of tidal influence, except perhaps during very severe winter storms.

In both the fresh-water and the estuarine segments its aquatic properties have been influenced to a very great degree by individual property owner's decisions to armor streambanks on their property, the toe of those banks, and even the creek bed itself in many locations against erosion. Where concrete was placed below the ordinary high water mark, the result can be a solid projection into the low flow path of the creek in some places, a uniformly broad, flat surface (e.g. upstream of the Gutierrez Street Bridge), or concrete edges that confine the creek's low flow route to a narrow course. Estimates of the length of the streambed where only natural surfaces are evident (admitting the probable existence of some concrete now covered thoroughly by native sediments) were made by walking the creek. Natural sediments (silty muds and gravels) compose the streambed for about ⅔ of its length within the project area (3560/5380 = 0.66), while hardened surfaces cover roughly ⅓ the length of the stream bed (1820/5380 = 0.33).

The County Flood Control presently cleans the fresh water portions of the creek as needed to remove accumulated sediments, obstructive growth of plants, and accumulated debris. Sporadic accumulation which diminishes its conveyance capacity by more than 15% triggers that need for maintenance. That maintenance procedure has stripped the creek bed of most natural features that would have contributed to a heterogeneous stream channel. In fact, virtually all pools in this reach of Mission Creek have formed where complex hydraulic interactions between man-made structures and currents caused differential erosion and deposition of sediments. They are also transient for that very reason, and therefore tend to change in size from one season to the next. Those at bridge abutments are largest, e.g. estimated as 5 feet deep, 15 feet wide, and 40 feet long. Two such pools existed in May 1999. Concrete ledges poured by private owners have also created pools where currents undercut them. The longest seen in May 1999 was estimated as 25 feet in length and possibly 4 feet deep. The smallest such ledge pool was about 7 feet in length and perhaps a foot deep. Four undercut concrete sills of this nature were identified in May 1999. Two natural pools have formed amid rocks and concrete rubble in the oxbow. Each was approximately 10 feet long, 1½ feet deep and as wide as the channel. While these isolated pools were evident in May 1999, on the whole Mission Creek lacks any substantive areas of runs, riffles, pools, turbulent waters and eddies.

The existing streambed, albeit slightly squared in profile at many locations by periodic channel maintenance and constrained by numerous private revetments of assorted design, still suffices for mature steelhead to return up Mission Creek (Cardenas, 1998; Spina, 1998) and young steelhead to swim down its length. Concrete and trapezoidal channelization of the stream bed and banks upstream of this project probably hinders potential migration both directions in Mission Creek (Cardenas, 1998). Despite this physical impediment, and the existence considerably farther upstream of a small dam across Mission Creek to catch debris, the California Department of Fish and Game regards Mission Creek to be among the better streams for anadromous trout south of Point Conception because it still affords satisfactory capacity for salmonids to navigate the channel (Cardenas, 1998).

3.2 Stream Bank Vegetation

Construction of walls, an essential component of the project's design and without which the footprint of direct impacts would have to be twice as large to achieve the same conveyance, would require removal of most extant vegetation along 78% of the lower reach of Mission Creek, about 8420 linear feet (counting both the right and left banks). The remaining 22% of its existing banks, about 2340 linear feet (on both sides of the channel) between Highway 101 and the downstream side of Yanonali Street, are entirely bare of plant growth.

In those areas to be disturbed by stream bank construction, the presence of hardened bank surfaces currently exerts a strong effect on the abundance and vigor of plants along the creek. A soft bank occurs along 1940 linear feet of stream bank (counting both sides), while 6,480 linear feet (measured on both sides) have been armored by some means or other. In essence, hardened surfaces line about 77% of the creek's banks, aside from that stretch between the freeway and the upper most end of the estuary. Section 10 of the EIS/EIR provides details on existing vegetaion within the project reach. Maintenance, monitoring goals, success criteria for native plants to be included in the project's design, and so forth are identified in the Mitigation Monitoring Plan.

These revetments, of quite diverse materials and thoroughness, are not uniformly solid and impenetrable by plant roots. However, plants native to a stream side habitat in southern California are few and far between. Save for large and venerable western sycamores (*Platanus racemosa*) at six locations along the creek, it retains almost none of the stratification of canopy and understory species it must have had a century and more ago. Widely scattered arroyo willows (*Salix lasiolepis*) and white alders (*Alnus rhombifolia*) growing even more sparsely hint of what was once there below its riparian canopy, but nothing more than hint. Invasive non-native species compose virtually the entire plant assemblage along the creek. Now, giant reed (*Arundo donax*) forms the most conspicuous element of stream bank vegetation, and probably would rank highest in biomass of anything growing along the creek.

4. POTENTIAL EFFECTS TO STEELHEAD

4.1 Locus of Project along Lower Mission Creek

The proposed flood control construction along Mission Creek would extend from Cabrillo Boulevard at the downstream limit to the intersection of Castillo and Canon Perdido Streets (Fig. 3) at the upstream end of the project. It would entail:

- mechanical excavation and expansion of the streambed (except through the oxbow channel),
- construction of vertical walls of varying heights,
- construction of a culvert to create an alternative flow which bypasses the oxbow at discharges greater than 640 ft^3/sec,
- fabrication of several structural mitigation features,
- planting native trees and shrubs along reshaped bank and at select locations adjacent to the banks.

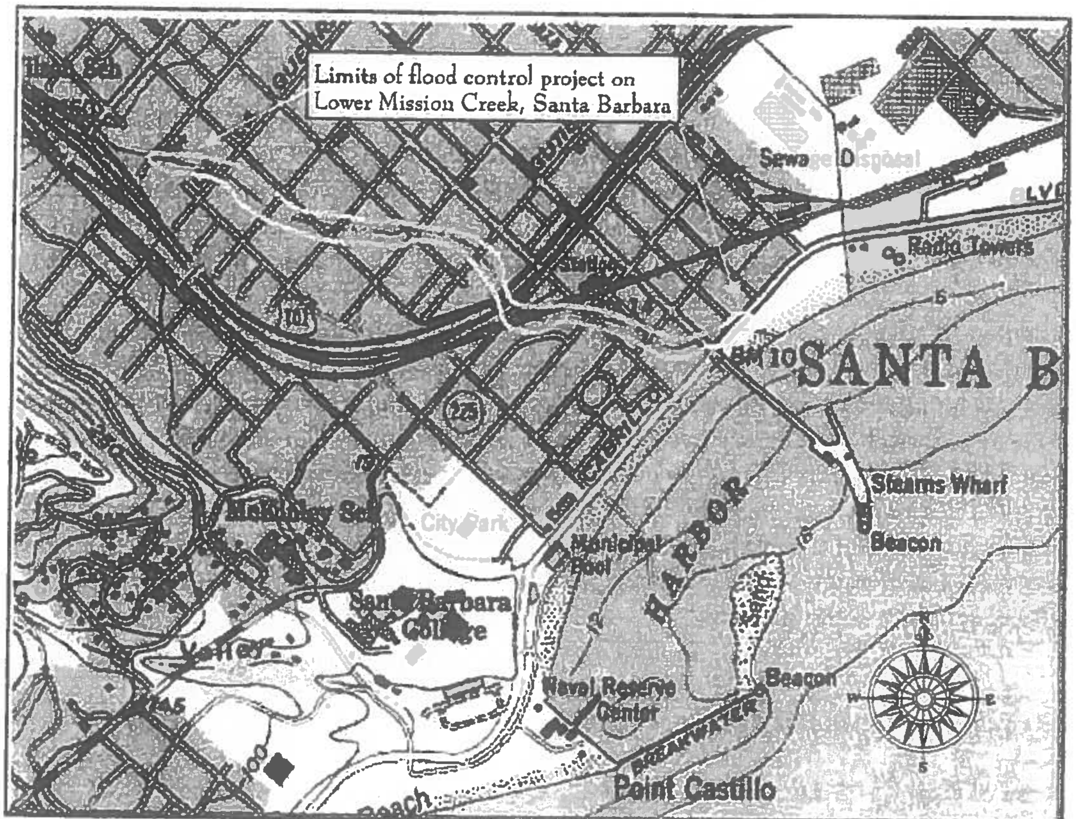


Fig. 4. Proposed flood control project would extend from Cabrillo Boulevard, at the lower end of Mission Creek, to Canon Perdido Street at the upper end. Excerpt from 7½ ′ USGS map, Santa Barbara Quadrangle.

Full descriptions of the project's design along each section of the creek may be found as an attachment, Project Description. The effects of specific components of the design which pertain directly to ecological requirements of steelhead are described in Chapter 5, which follows.

4.2 Flood Control Construction and Future Maintenance May Affect Steelhead

Construction between Cabrillo Boulevard and Yanonali Street. The most likely potential cause of adverse effects to steelhead will lie in the necessity to dry the streambed and toe of banks prior to construction. The plans for flood control construction would minimize this possibility through a combination of timing the work to give the best match to the life history patterns of steelhead migration, on-site monitoring for and supervised relocation of fish, and means to de-water only half the creek at any one time, thus always allowing steelhead unfettered movement in half the estuary. Nonetheless, netting and moving fish would affect them in a temporary and adverse manner. Please refer to the Mitigation Monitoring Plan for a summary of project related mitigation and monitoring.

Construction between the oxbow and Canon Perdido Street. Direct mechanical injury of fish or indirect but adverse effects such as impaired respiration caused by greatly increased turbidity could have impacts to steelhead while construction is underway in these upper waters of the project area. Measures to avoid or minimize unavoidable impacts include scheduling construction work outside the migration period, on-site monitoring for and supervised relocation of young salmonids encountered unexpectedly, temporary barricades at the upstream end of sections under construction to exclude smolt sized fish, or temporary use of a pilot channel through the current construction area screened at its upper end to block smolt-sized fish. Any fish netted and relocated would sustain adverse and temporary effects.

Routine channel maintenance. During winter storms, the creek presently scours pools at bridge abutments, e.g. the upstream side of that at Bath Street and that at Highway 101. These may persist through the dry season when sufficiently large and sheltered in the shade of the bridge itself. Although an unlikely event, young salmonids who get washed downstream before they are ready to swim to sea and are not yet strong enough to return to waters higher upstream would try to survive in such pools. As a precaution during the annual maintenance cycle, any young trout holding out in such refuges would be subject to supervised relocation. Steelhead netted and moved for their own well being would sustain adverse and temporary effects nonetheless.

5 HYDRAULIC CONSIDERATIONS ON MIGRATORY BEHAVIOR OF STEELHEAD

The proposed designs to accommodate runoff equal to 3400 ft^3/sec through this region of Mission Creek necessitate structural changes of the creek bed and its banks. In turn, these will bring about hydraulic changes when compared to existing conditions. The effects of structural changes — wider streambed, soft bottom of the streambed upstream from Highway 101 and downstream of Yanonali Street, a uniform gradient of that streambed, lower water velocity at any given discharge, a shift of sedimentary deposition upstream from where bedloads now tend to settle, walls to confine the creek channel and keep the banks in place, and a culvert to bypass the oxbow channel — have been analyzed with appropriate numerical models. Results of those models constitute the second attachment to this BA. Interpretations of those results appear below in regard to ecological needs of steelhead during migration, typically as representative cross-sectional evaluations. However, these interpretations are not meant to substitute for those numerical results and the reader's attention is directed to that attachment for any and all relevant hydraulic information.

5.2 **WIDER CREEK AND CHANNEL.** Greater capacity of the streambed would come, in part, through lateral expansion by excavation of existing stream banks. Expansion of the creek's width would not be uniform throughout its length. Instead, different segments would widened different amounts:

Table 2. Larger streambed as a result of flood control design						
segments bounded by streets	existing creek bed width (average)		planned creek bed width		% increase	
	feet	acreage	feet	acreage	feet	acreage
Canon Perdido to Haley Streets:	25 feet	1.22 acres	43 feet	2.10 acres	75% wider	72% larger
Haley to Gutierrez Streets:	25 feet	0.39 acres	50 feet	0.78 acres	100 % wider	100% larger
Yanonali Street to Cabrillo Boulevard:	27 feet	0.69 acres	60 feet	1.54 acres	71% wider	220% larger
streambed habitat		**2.30 acres**		**4.42 acres**		**92% larger**
net change				**2.12 acres**		

5.3 NATURAL BOTTOM.

At present, concrete has been placed on the bottom or along the sides of the creek over at least 33% (1820 linear feet) of the streambed, or as estimated by existing streambed area, on about 20% of that (*ca.* 0.52 acres/2.3 acres = 0.2). Estimates are conservative because more could well be present but unseen because sediments cover it.

All existing hardened bottom would be removed and replaced by native sediments throughout except within the historic sandstone channel and beneath bridges already built as box culverts. In total, approximately 4450 linear feet of streambed would be surfaced with native sediments. Incorporating the three distinct widths of the final design — 43, 50, and 60 feet — the proposed design would yield approximately 4.4 acres streambed, and all this would be without any hardened surfaces, just soft, native sediments. This would amount to an increase of nearly 2⅛ acres over the current size.

The native sediments which underlay Mission Creek would become the actual stream bed after all existing hardened surfaces have been removed. Subsequent aggradation of materials derived from the Santa Ynez Mountains, primarily cobbles and coarse gravels, would restore the bottom's native irregular and varied texture. Together with finer sediments lodged among them, invertebrates and herbaceous plants would benefit incidentally.

5.4 LONGITUDINAL STREAMBED PROFILE

The streambed will have a constant pitch when completed, particularly at bridges. No discontinuities in the slope of the creek's channel will occur anywhere within the project, nor at the transition to the trapezoidal section of Mission Creek upstream from Canon Perdido (see Hydraulics attachment). In consequence of this design feature, steelhead will not confront drop structures of any kind from either direction.

5.5 Current velocity

The existing stream channel has considerable topographic variability in addition to being rather narrow on average. The lateral expansion coupled with restoration of soft bottom throughout would have the overall effect of slowing the water at any given discharge. Calculations from appropriate numerical models of the stream channel (Hydraulics appendix, HEC-RAS output) were made at 50 foot intervals of measured stations. Among those, seven representative cross-sections have been selected to represent the general pattern (Table 3). These seven happen also to be the cross-sections for which sediment deposition budgets were calculated, as well. By location, they are shown in Fig. 3.

Table 3. Water velocities as calculated (HEC-RAS model) for seven representative stream cross-sections.

	Velocity (ft/sec) of Mission Creek when conveying 640 ft^3/sec	
representative cross section	existing channel	proposed wider channel
11	4.55	6.88
10	8.14	6.17
9	5.15	3.42
8	10.22	4.68
7	5.57	4.38
6	9.37	4.38
4	1.92	3.89

At two cross-sections, stream velocity is expected to rise compared to existing patterns. At five of them, stream velocities are projected to be lower than the current conditions. On average, stream velocity at a discharge equal to 640 ft^3/sec would by 95% of the current conditions.

5.6 Sediment Budget

Stream flow data recorded through the period of record (at USGS stream gage station № 11119750 on Mission Creek near Mission Street, approximately 1½ miles upstream of the top of the project) were analyzed by appropriate statistical techniques (HEC-1 Flood Hydrograph Package, see Hydraulics attachment) to give valid and comparable models of peak and average daily flows. Such numerical models, called balanced hydrographs, then were applied in conjunction with the specific hydrograph of the record flood (that of January 10, 1995 when peak discharge reached 5200 ft^3/sec and the 24 hour average discharge was 1400 ft^3/sec) to calculate projected movement of sediments.

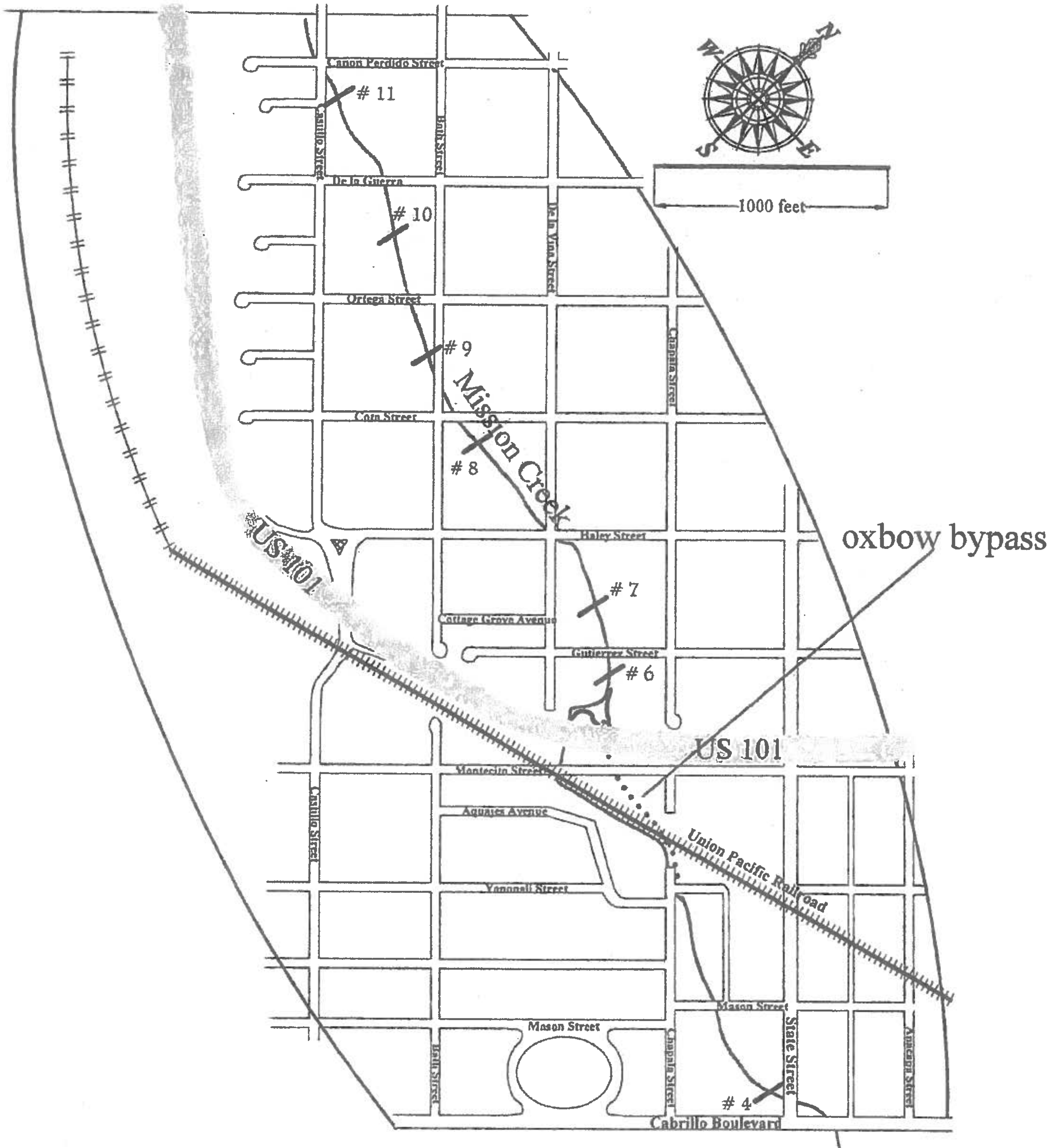


Fig. 3. Location of representative cross-sections

Each calculation (Table 4) pertains to a single storm event, even though the present and future needs to remove sediments arise from net aggradation from the sporadic patterns of individual storms over a period of time. Projections for sediment movement at seven representative cross-sections (Fig. 3) have been derived at three representative levels of discharge. In a harsh year, the sediments from many storms could trigger repeated maintenance cycles within certain reaches of the creek. On the other hand, several mild winter seasons may come and go without need for any maintenance of the streambed.

Table 4. Anticipated pattern of sediment deposition or erosion at seven cross sections on Lower Mission Creek. Results come from numeric modeling of sediments budgets based on balanced, synthetic hydrographs for each of three flow conditions. All results are in units of cubic yards (yd^3) and represent the expectation of sediment movement arising from a single storm event whose peak conveyance corresponds to either the yearly average event for Mission Creek (640 ft^3/sec), a storm event that occurs on average once every 5 years (1470 ft^3/sec), or a storm event that occurs on average once every 20 years (3400 ft^3/sec). Columns headed 'current' and 'designed' show sediment patterns for the existing conditions and the proposed flood control project, respectively. The columns headed 'difference' show how sediment patterns would change as a result of the project.

Cross section	net effect	640 ft^3/sec discharge			1470 ft^3/sec discharge			3400 ft^3/sec discharge		
		current	designed	difference	current	designed	difference	current	designed	difference
# 11	erosion	-333	-1850	-1517	-939	-5081	-4142	-2683	-14155	-11471
# 10	deposition	-820	1348	2168	-2075	3691	5767	-5305	10251	15555
# 9	erosion	252	-297	-549	599	-1384	-1983	1425	-5862	-7287
# 8	deposition	383	483	100	1061	1892	831	2973	7268	4294
# 7	deposition	-1181	185	1365	-3237	513	3750	-8991	1444	10434
# 6	erosion	592	-56	-648	1624	-111	-1736	4518	-198	-4715
# 4	erosion	581	-313	-895	1594	-928	-2522	4422	-2773	-7196
net difference				25 yd^3			-35 yd^3			-385 yd^3

Sedimentary regimes are predicted to change most at cross-sections 10 and 7. In both locations, the current erosive pattern would shift to one of net deposition. The opposite kind of change, from a current depositional pattern to one of net erosion during a storm event, would characterize three cross-sections. For example, storm events would be expected to remove silts and fine sediments from the estuarine section of the creek, cross-section 4. A similar change to net erosion would occur at cross-sections 9 and 6, both upstream of Highway 101.

The change from existing conditions to design conveyance capacity would alter the net sediment budget for the entire project very slightly. A net total of 25 yd^3 should accumulate each time the creek carries an average storm event. In contrast, individual higher peak flows should promote net erosion from the streambed, 35 yd^3 during a 5-year storm event and roughly ten times that quantity removed during a single design event.

5.7 Toe-Walls and Banks Stabilized by Ungrouted Riprap and Planted with Native Species

Bank stabilization upstream of Highway 101 would rely primarily on slopes armored by riprap. Cylindrical planters placed through the riprap would admit canopy and understory species. The final surface would be hydro-seeded with an appropriate mixture of annual and perennial native grasses. In total, about 3900 linear feet of riprap bank would be created. In nearly all locations, this design creates a plantable corridor slightly more than 11 feet wide, so the proposed project would install just under 1 acre of stream bank corridor.

This bank treatment would be applied mostly upstream of the freeway. It cannot be used where vertical walls must be retained (e.g. left hand bank above De la Guerra Street), or other structural requirements dictate (e.g. nearly all the way below the sandstone channel, except the left hand bank below Yanonali Street).

As illustrated roughly in Fig. 4 poured walls would define the bottom portion of the channel but the bank above those walls would angle outward to the top of the bank. The sloped bank would consist of riprap 15 inches thick, top soil distributed through the interstices of the riprap, and all overlain by 10 inches of prepared topsoil. Native rock and soils as its base would

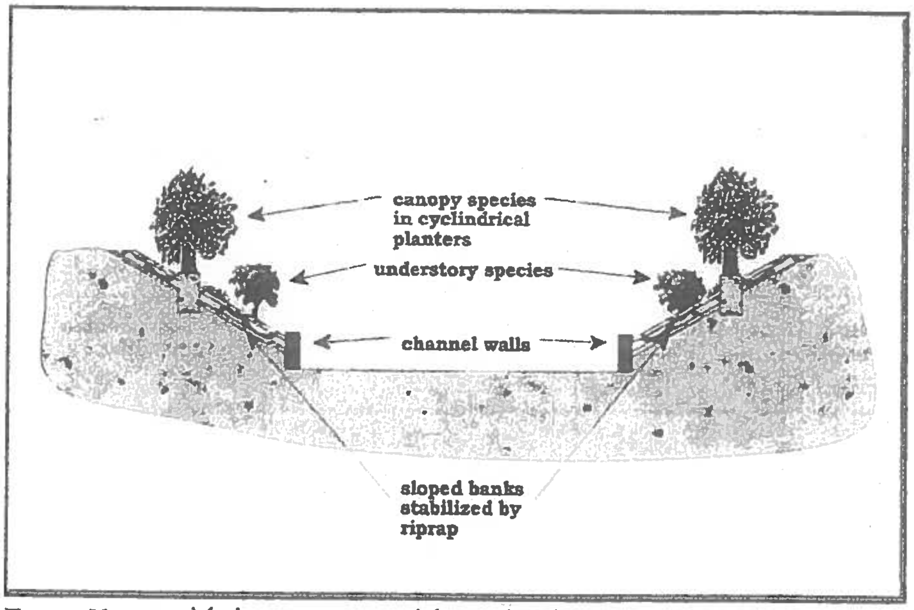


Fig. 4. Very simplified representation of the combined features of the preferred flood control design. It incorporates bank stabilization of riprap planted with native vegetation above low channel walls. It depicts a typical cross section of Mission Creek and suggests the opportunities for restoring the principal native species at the core of a riparian community: canopy species such sycamores, cottonwoods, live oaks, etc; and understory species such as arroyo willow, Mexican elderberry, coyote brush, etc.

accommodate planting riparian trees and shrubs. Large trees would be set out in defined planters which extend through the riprap. Willows would be planted as wattles below the riprap, to sprout through the interstices. Other native shrubs would be planted into the topsoil above the riprap. Appropriate, temporary irrigation would be installed to provide water long enough for plants to become fully established. Details of riprap slope construction, the selection of native plants to be included, their maintenance expectations, and criteria of establishment and growth are presented in the Mitigation Monitoring Plan.

5.8 Box Culvert as Oxbow Bypass

The design capacity, 3400 ft^3/sec and which corresponds to a storm event that occurs once every 20 years on average, requires a means to convey water past the most constricted portion of Lower Mission Creek. That constriction exists at bridges within the oxbow portion of the existing channel. Currently, water spills out first at the Montecito Street Bridge and the railroad bridge immediately downstream of it. The project incorporates a box culvert to carry the bulk of storm events whose discharge exceeds the yearly average event (640 ft^3/sec, a recurrence interval of 2.3 years) as that means.

The culvert will extend between the upper end of the oxbow and the Yanonali Street Bridge. The culvert and the existing watercourse will reunite immediately below that bridge. Design of this feature will lead all flows equal to or smaller than 640 ft^3/sec through the sandstone diversion channel, i.e. the existing course for Mission Creek. The design will not constrict in any substantive way the route water currently follows through the oxbow and sandstone channel.

When runoffs surpass that volume, the design will begin to divide storm flows into two paths by engaging the bypass culvert at the same time as directing some additional water (in excess of 640 ft^3/sec) to follow the existing path to the ocean. Volumes up to1050 ft^3/sec will be entrained through the oxbow and sandstone channel, just as they currently flow. Simultaneously, the culvert will shunt as much as 2350 ft^3/sec past the existing channel.

6 Structural Features Which Mitigate Temporary Adverse Effects

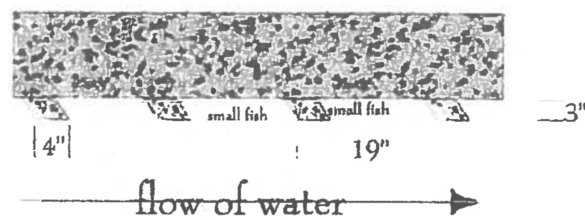
In actuality, a second fish species which is also Federally protected, tidewater goby (*Eucyclogobius newberryi*) inhabits the estuarine portion of Mission Creek. Elements of the proposed flood control project intended as compensatory mitigation for incidental but adverse effects to steelhead also apply to tidewater gobies. This species is included hereafter.

All impacts to either fish species would be of temporary nature. The project would not permanently reduce net reproductive rate ($R_0 \approx \int l_x m_x dx$), age-specific survivorship (l_x), age-specific fertility (m_x), or dispersal ability of either species. Incidental take is likely to occur despite environmental commitments described in Chapter 7 however, so mitigation is appropriate. Broadly, these elements would improve habitat conditions for both species. They are summarized in the following table and more detailed descriptions follow that.

Table 5. Structural features which each partially mitigate for adverse effects to steelhead and tidewater goby. Indirect benefits come about by raising the quality of aquatic habitat in the estuary or the riverine portions of the project area.

	direct compensatory benefits		indirect compensatory benefits	
Project feature	steelhead	tidewater goby	in-stream fauna	movement of water
soft bottom	natural sediments create rough surfaces which ease upstream migration	more bottom surface as foraging area	promotes larger invertebrate populations	lower runoff velocities
expanded estuary	larger area where smolts can bide their time just prior to entering the ocean	greater water volume to hide from predators		
ribs on estuary walls		a boundary layer refuge of lower velocity and eddy currents		no reduction of channel conveyance
horizontal ledges on estuary walls	sheltered overhangs as resting places	shelter from predators		no effects on channel conveyance
fish baffles on estuary wall	hiding places for smolts	hiding places	many species prosper in these varied microhabitats	no effects on channel conveyance
in-line and side weir a oxbow	prevents flows from entering culvert when steelhead could be present			divert all flows ≤640 ft^3/sec through existing watercourse
mid-stream boulder clusters	create heterogenous flow regimes and resting pools		varied microhabitat conditions would favor many species	absorb momentum of strong flow regimes
horizontal ledges on riverine walls	sheltered resting spots		promote scour pools where water persists through dry months	no effects on channel conveyance
fish baffles on riverine walls	turbulent and varied flow regimes during migration		varied microhabitat conditions would favor many species	no effects on channel conveyance

Fish refugia in the estuary. Permanent and durable mitigation features to create hiding places where fish may take refuge would be composed from three separate structural elements by forming coarse surface relief of the walls, artificial overhangs projecting from the walls, and placing double rows of coarse boulders between the overhangs along the walls of the estuary. In combination, they should provide shelter for fish of all sizes.



High-relief surface ornamentation where gobies and other small fish could escape strong currents would be made in a pattern of slanted ribs. Each would be molded as a parallelogram to stand 3 inches proud of the wall surface, 4 inches wide, and whose downstream face would form an acute angle to the wall. Nineteen inches would separate one from the next, as illustrated. These molded ridges would extend from the ordinary high water mark to the bottom of the formed wall, roughly eight feet in vertical length. Most of the time water in the estuary would cover them completely and each would extend well below the streambed. Lower velocity and localized eddy currents would exist around these ribs, primarily caused by the effects of protruding ribs on the boundary layer adjacent to the wall itself. Small fish the size of gobies would easily find the recesses on their downstream side and take advantage of the refugia from currents created by these mitigation structures.

The second component of structural mitigation features, these intended primarily for steelhead and other large fish, would consist of projecting ledges. Ledges would jut perpendicularly from the wall 2 feet into the flow, be 6 inches thick, and roughly 50 feet long typically. Within the estuary, jutting ledges would be built at varying heights, say 10 to 20 inches, above the invert of the streambed and substantially below the ordinary high water level. Water would cover these ledges at all except the lowest low tides and all fish could easily swim beneath them.

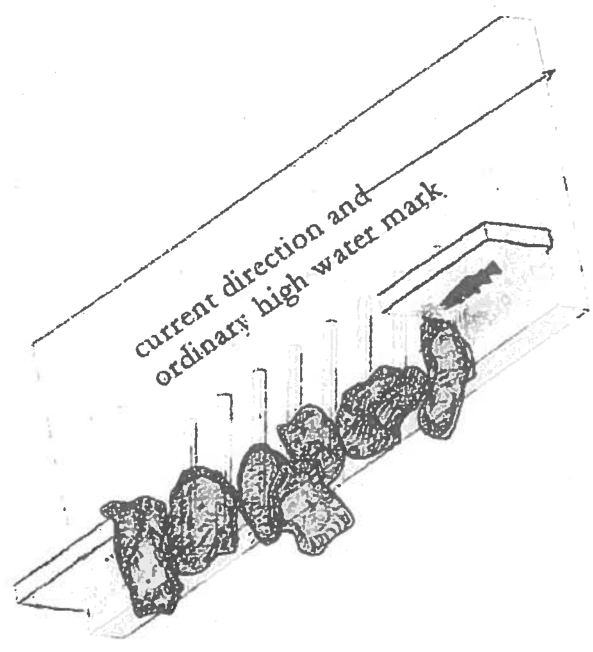


Fig. 6. Ribs, boulders, and ledges within the estuary. The streambed would be about level with the truncated bottom of the wall; not to scale.

The space between successive projecting ledges allows a third mitigation measure: boulders of sufficient weight to stay in place against the velocity of design events (approximately 8 ft/sec) (Hydraulics attachment). A double row of large, angular rocks would be nestled together and placed against the wall at the foot of the ribs. Ranks of boulders would extend into the creek about 5 feet from each wall. The innumerable crevices, voids between rocks, and spaces between rocks and the wall itself formed in this orderly jumble would provide thoroughly natural habitat for small fish and invertebrates. A fraction of those spaces should prove large enough for steelhead smolt also to find shelter amongst the rocks

Ribs, boulders, and ledges would line both sides of the estuary between Cabrillo Boulevard and Mason Street. All surfaces in this section of the project would have all three features intermixed, although a ledge on one wall would face ribs and boulders on the opposite wall (Fig. 6, where ledges are not drawn to scale length). Lengths of the walls allow 380 linear feet of fish ribs and boulders and 240 linear feet of overhanging ledges on the left hand side; 360 linear feet of fish ribs and boulders and about 300 linear feet of ledges on the right-hand side. A more succinct rendering of these three mitigation features together appears in the Preliminary Design Plans attachment, sheet 8.

Locations in the estuarine portion of Mission Creek where ribs, boulders, and ledges would be built are shown in the Project Design attachment, Exhibit 4, sheets 1 and 2.

Underground bypass of oxbow channel.

In actuality, the existing watercourse and the culvert must function as paired alternative channels which accomplish two separate needs. First, the existing oxbow must behave as the sole channel for all discharges less than the yearly average event (640 ft^3/sec, a recurrence interval of 2.3 years), i.e. the culvert cannot begin to accept any water until flows exceed 640 ft^3/sec. Secondly, when discharges exceed that threhold the water's momentum must carry it toward the culvert preferentially and away from the oxbow to counteract the existing route's tendency to take on flows in excess of the limiting conveyance capacity, i.e. flows larger than 1050 ft^3/sec must be captured by the culvert. At the design limit, the culvert will shunt as much as 2350 ft^3/sec past the existing channel while 1050 ft^3/sec pass through the oxbow.

This switching hydraulic property of oxbow and culvert can be achieved by construction of a weir which combines both lateral and in-line elements arranged in a direct line with the current and the entrance to the culvert. The plan drawings (**Hydraulics appendix**) depicts its length, width, cross-sectional profile, and combined lateral and in-line characteristics of the surfaces which establish the threshold at which water begins to enter the culvert. Based on numerical solutions (**Hydraulics appendix, HEC-RAS output**), it would need to be slightly taller than 3 feet to have an operational threshold of 640 ft^3/sec and approximately 240 feet in length to accommodate discharges in excess of 1050 ft^3/sec, the capacity of the oxbow channel. Further refinements of design criteria for the weir could emerge later during the project engineering design phase. Any such refinements would also incorporate recommendations from hydraulic evaluations by NMFS itself.

The lateral portion of the weir complex which would extend toward the Gutierrez Street Bridge would occupy about 22 feet (to the outer side of the structure) of the finished design width of the stream bed itself, 50 feet wide (**Preliminary Design Plans attachment, sheet 9**). The difference, about 28 feet, would be creek bed with natural bottom. The existing stream bed along this specific portion of the creek tapers over a distance of about 125 feet from 35 feet wide (10.8 m as measured May 4th 2000) immediately below Gutierrez Street to about 22 feet. In the next 75 feet it widens again to approximately 27 feet. Thus, construction of the side portion of the weir can be achieved with no restriction compared to the existing streambed width. Water velocities adjacent to the weir are projected to range between 4.39 and 1.88 ft/sec at a discharge equal to 640 ft^3/sec (Hydraulics appendix, HEC-RAS output). The existing streambed passes through this constricted point at more than twice that, 9.37 ft/sec. Since the soft-bottom portion of the creek would be wider than the existing conditions than with the lateral weir in place, the weir would not increase water velocities through this region of the creek; before water starts to pass over the weir. Indeed, water velocities between Gutierrerz Street and the start of the oxbow should be substantially lower than occur now.

The downstream end of the culvert would be at grade level, and the streambed here armored by riprap to prevent scour below the culvert. Before the controlling weir begins to pass water into the culvert and thus create a current through it, flows down the existing channel will back up into the culvert from the bottom and create a static pool of variable length depending on the discharge at the time.

Mid-stream boulder clusters. Baffle structures the full width of the streambed and 300 feet in length would combine clusters of large boulders and fields of riprap at two locations, the two separated by about 2350 linear feet of streambed **(Project Design attachment, Exhibit 4, sheets 3 and 5)**.

Stone used for riprap would be as large as15 inches in diameter and of angular character. Larger boulders, essentially individual derrick stones of 3 to 4 feet diameter each, would be set down into the surrounding riprap, placed 5 to 8 feet apart, and arranged in clusters of 6 to 9 individual boulders. Tips of the rocks would protrude 1½ to 2 feet above the streambed **(Preliminary Design Plans, sheet 6)**.

The boulder patches would constitute islands of very coarse and permanent streambed irregularities. Upstream of them, Mission Creek would tend to flow as a homogenous, single current. By their placement, these clusters ought to disrupt that flow regime and induce smaller and intertwined subcurrents. These many smaller currents should continually reshape the longitudinal profile over the length of the baffles fields and downstream of them for some way.

Each cluster of boulders would naturally form various internal cross currents and protected patches of water. Placement of clusters within the baffle field **(Project Design attachment, Exhibit 4, sheets 3 and 5)** is intended to promote the variety of water conditions trout seek out in natural streams, so clusters would be placed to outline a sinuous and meandering predominant channel, one that shifts back and forth across the streambed.

Ledges upstream of Mason Street. Overhangs of like design would be placed along the riverine sections of the creek (including the length between Mason and Yanonali Streets, otherwise treated as the upper end of the estuary) where currents should impinge against the wall and scour persistent holes under these ledges. Adult steelhead would have access to these pools during upstream migration. All manner of aquatic animals would take advantage of these sheltered pools throughout the dry season.

Walls on both sides of the creek would have them, placed as indicated by current patterns (**Project Design attachment, Exhibit 4, sheets 2, 4, and 5**). Four would be built along the left hand side (approximately 200 linear feet, in total) and five constructed against the right hand side (total of 250 feet in length).

Fish baffles upstream of Mason Street. Arrays of large boulders placed to the inside of walls would impart diverse flow patterns and a valuable measure of aquatic heterogeneity, lacking which the creek's streambed would mostly resemble an unrelentingly flat surface characterized by steady sheet flows. Their mass and position adjacent to the wall, and thereby within the boundary currents inherent to sides of the channel, would minimize the incidence of currents dislodging them.

Each baffle would consist of a rank of large rocks or derrick stone placed touching the inside surface of the walls, with a second rank inside the first and closer to the creek. Rocks would stand proud of the streambed by 18 to 24 inches. Together, the two ranks would extend inward toward the creek approximately 5 feet. A space of 5 to 8 feet would separate individual rocks, or perhaps pairs of boulders, to facilitate periodic removal of sediments from between them.

Fish baffles would occupy locations in lower velocity sections of the creek, on one side or the other as appropriate to its curvature. In certain lengths of the creek side baffles would be placed along one side only, then for another length be built against the opposite side. Many baffles would extend along 150 feet of the creek's side, a few up to 200 feet in length, while others would be shorter by necessity. Design restrictions prevent their placement beneath bridges, for a certain distance on the upstream side of bridge abutments, and directly opposite other baffles or ledges.

The creek's channel allows fish baffles to be interspersed with ledges as indicated by the prevailing direction of currents and streambed to encourage formation of varied stream features (**Project Design attachment, Exhibit 4, sheets 2, 4, and 5**). Side baffles would be installed over approximately 1400 linear feet of the stream's edge; 675 linear feet of fish baffles on the left and 725 linear feet on the right side.

7 Environmental Commitments to Minimize Temporary Adverse Construction Effects

If stream flow conditions are suitable, adult steelhead would be most likely to try the ascent between the middle of December and the end of March. Adolescent steelhead could be present in the creek from the middle of March through late May, on their way to the ocean. Their tenure in the lower creek depends on the speed of changes necessary for them to tolerate salt water after the first phase of life in fresh. Those complex changes transform them physiologically from young trout into steelhead smolt.

Spawning by tidewater gobies peaks in March and April. They construct egg clutches in gravely substrates, such as that found in the tidal lagoon below Cabrillo Boulevard. Gobies would be expected sporadically in the estuary through summer and fall, but are unlikely ever to swim upstream of Yanonali Street, primarily because a low sill spans the full creek bed at that bridge where water is quite shallow after the rainy season, and secondarily because gobies prefer more saline waters compared to the flow issuing from the sandstone channel consists which entirely of fresh water.

Measures to lessen impacts to both fish species during streambed, toe-wall, and side slope construction would differ from those applicable during annual maintenance. All are inherently geared to the two species' respective behavior which leads to spawning in their respectively different habitats. Some measures appropriate to construction needs in the estuary (where construction would begin) are not appropriate farther upstream, so they are set out here as though in two separate regions. Work in the estuary will necessitate drying half of it at a time, from the center line to one bank, then switching sides for the opposite bank. A temporary construction exclosure is the preferred method for this requirement. While one half the estuary has thus been dried, normal tidal flush and flows regimes of the dry season can still pass through other half. At no time would the complete streambed be dammed. Work from the oxbow up will necessitate temporary diversion of lower flows. The least injurious method entails placement of a buried culvert into a suitable pilot channel and fitting its intake with appropriate fish barriers, and continuous monitoring.

Construction between Cabrillo Boulevard and Yanonali Street:

1. No construction work in water anywhere in the estuary from mid-December to mid- June;
2. divide a suitable length of the estuary down the middle with an impermeable barrier, perhaps sheet piling. That length should be as long as practicable to minimize repetition of this divide and dry procedure for making temporary construction exclosures. A lateral coffer dam in mid-stream shall not be acceptable because of increased turbidity and fine sediments that would conveyed downstream to the coastal lagoon;
3. Dam half the estuary at the upper end of the center-line barrier with sheet piling;
4. Qualified biologists walk downstream in zigzag pattern to herd as many fish as possible from the incipient exclosure;
5. Dam the lower end of the exclosure with sheet piling immediately;
6. Fish biologists seine the entire confined half thoroughly to remove any gobies and other large organisms to the wet side of the construction exclosure;
7. Commence pumping water from the exclosure with intakes to pump fitted with ½ mesh screens;
8. Fish biologists monitor drying exclosure and seine it thoroughly at least twice a week;
9. When construction on one side has been complete, the downstream wall of the exclosure shall be removed first, followed by the upstream end;
10. Repetition of the steps above on the opposite bank

Construction between Highway 101 and Canon Perdido Street:

11. No mechanized equipment permitted in water between December 15 and the end of March;
12. Prior to starting work in the next region upstream, a qualified biologist would examine all scour pools at bridge abutments, undercut concrete ledges, etc.;
13. Any steelhead, or young salmonid fish in particular, found unexpectedly in these small refuges would be relocated upstream to a receiving area previously identified and agreed upon by NMFS and CDFG and in a manner thoroughly consistent with appropriate transportation techniques. If authorized, the monitor shall weigh, measure, remove a sample of cheek scales, remove a sample of adipose fin, and apply a permanent identification tag of acceptable properties to each salmonid discovered and relocated;
14. The biological monitor shall prepare a written report giving all pertinent details of fish relocated;

15. Silt curtains shall be deployed below the immediate area of construction. Curtains would be deployed in pairs, with a gap at least 30 feet wide between the upstream and the downstream curtain to reduce suspended sediments in the water;
16. A temporary net of appropriate size as agreed upon by NMFS and CDFG shall be strung across the existing low flow channel to prevent salmonids from entering the section of creek next to be constructed;
17. Once certified free of protected fish, the existing current would be diverted to a temporary pilot channel shall be scored in the center of the creekbed;
18. As many culvert pipes as determined necessary to carry anticipated low flows shall be placed into the pilot channel. A mesh filter no larger than ½ inch square shall cover the intake. Culverts shall be at least 24 inches in diameter. Culverts shall not be longer than 100 yards;
19. Once culverts have been placed, the biologist shall monitor each section at least twice a week to verify that screens are in place over intakes and water has not leaked into the local section under construction;
20. Prior to completion of work in a given section, the temporary net shall be resuspended upstream of the culvert intake and fully across the existing low flow channel;
21. Only then shall removal of the culvert and completion of the natural streambed downstream be allowed;
22. The pair of silt curtains shall be removed;
23. The next upstream segment of creek bed and banks shall be readied in like manner.

8 Environmental Commitments to Minimize Recurrent Adverse Effects During Future Channel Maintenance

8.1 Routine Maintenance Upstream of the Oxbow

Above Highway 101, a biennial cycle of maintenance activities shall be instituted which incorporates a mosaic pattern of sediment removal from half the creek's bottom and mechanical brushing of vegetation in the other half each year, then repeating the process in the other half the following year. Debris reducing the channel's capacity would thus be removed from half of it in any given year. Mechanized equipment would be used in the creek bed to restore conveyance capacity, and the maintenance procedures would emphasize partial retention of aquatic habitat conditions (**Preliminary Design Plans, sheet 1, typical cross-sections**). Appropriate measures for:

Regular de-silting and brushing of vegetation in the creek bed —

24. All routine maintenance shall be accomplished between August and mid-October;
25. A pair of silt curtain fences shall be set across the low flow not more than 100 yards downstream of the work area;
26. the fences shall be approximately 10 yards apart;
27. A qualified biologist would examine all pools at bridge abutments for young salmonids;
28. Any trout present shall be captured by techniques dictated by National Marine Fisheries Service and California Fish and Game and relocated promptly to a suitable refuge;

29. A written report describing in detail any such relocations would be submitted to National Marine Fisheries Service;
30. Mechanized equipment would enter the creek via the access way at the parking lot of the church at Canon Perdido Street, that at Cota Street, or that immediately adjacent to the oxbow;
31. A front end loader or road grader working together with dump trucks (10 yd^3) would be used for the bulk of sediment and vegetation removal;
32. A front end loader or road grader working together with dump trucks (10 yd^3) would be used for the bulk of sediment and vegetation removal;
33. A swath half the channel wide shall then be cleaned, first along one side as seems convenient for an arbitrary distance (say, 250 feet), then switching to the opposite bank for another arbitrary distance;
34. the pilot channel would routinely head toward and pass close to projecting ledges to keep water flowing in their general direction during the dry season;
35. vegetation in the other half shall be mowed to suppress the growth of woody perennials but still allow herbaceous perennials and annuals to grow;
36. If storm events of the next winter rains leave enough sediments to warrant their removal, then during the following summer the other half of the creek bed, that where only brushing of plants occurred the previous year, would be groomed to remove obstructing sediments and plants, and to shift the chamfer and the pilot channel to the opposite side;
37. If storm events do not reduce conveyance more than 15% then the next maintenance cycle shall involve only mowing of vegetation

for maintenance of side baffles, ledges, and mid-stream boulder clusters —

38. Sediments would be removed from among boulder clusters and large rocks of the side baffles only as needed to prevent them from being covered completely;
39. If necessary, sediments shall be dug from the downstream side of boulders with a backhoe equipped with a 3 foot bucket, then dragged toward the center of the creek to be combined with streambed sediments being removed as described previously;
40. any individual boulders that might have been dislodged mechanically or displaced by currents would be pushed back into a suitable vacant spot in the baffle and reset.
41. Any propagules of giant reed or salt cedar that have taken root shall be eliminated. A combination of foliar application of glyphosphate or digging out rhyzomes with hand tools could be employed. Application of herbicides should be very limited, confined to only those small locations where the most persistent and aggressive weedy plants begin to re-invade the creek bottom;
42. The remaining growth shall be cut back using a brush hog, or similar mowing attachment passed a couple feet over the tops of the rocks. The intent is to cut down woody species before they attain much height or stem expansion, but not to eradicate low-growing herbaceous plants that offer negligible friction to water currents.

8.2 Maintenance Expectations Between the Oxbow and Sandstone Channel

The weir's height would push all flows smaller than 640 ft^3/sec toward and through the sandstone channel. In effect, the pattern by which sediments currently settle in the sandstone channel would remain unchanged.

Removal of silts and vegetation between the Highway 101 bridge and through the sandstone channel would continue to follow current practices.

- Sediments and vegetation would be removed when channel capacity has been reduced by more than 15%;
- All routine maintenance shall be accomplished between August and mid-October;
- A qualified biologist would examine all pools at bridge abutments for young trout;
- Any trout present shall be captured by techniques dictated by National Marine Fisheries Service and California Fish and Game and relocated promptly to a suitable refuge;
- A double line of straw bales or silt curtain shall be set across the lower end of the channel;
- A front-end loader would scoop all materials directly from the channel to trucks waiting above adjacent to the railroad tracks;
- The full width, 33 feet, would be cleaned of obstructive materials.

8.3 Maintenance expectations Within the Estuary

Projections of sediment transport indicate greater erosion from storm events than currently takes place. During storms, water entering the culvert would carry less sediment than it could by virtue of the blocking effect of the weir. When flows through the culvert and sandstone channel converge, this volume of cleaner water would resuspend fine sediments. Hence, the net effect of the project within the estuary should shift the composition of the streambed to gravels and small rocks, rather than fine silty sediments. Removal of silty materials or other fine sediments from anywhere in the estuary should not become a maintenance requirement of the project.

9 Documenting no permanent adverse effects

Steelhead belonging to the southern evolutionary population appear rather opportunistic in their migratory behavior, both in the number of individuals who make the ascent in any given year — in fact, years when none are seen anywhere in the creek are not uncommon — and the time of year when they enter the watershed. River flow seems to be the factor which most clearly prompts adults fish to try to reach spawning areas in southern California coastal streams. Since the quirks of winter storm patterns in this region cause quite unpredictable flow patterns from one year to the next, their migratory tendencies are controlled by this climatically irregular but annual phenomenon.

Confirmation of adult steelhead appearing in suitable pools and runs, mostly upstream of Rocky Nook and into the higher reaches of Mission Creek or Rattlesnake Creek, following winter rains would constitute evidence of proper aquatic conditions within the length of the proposed flood control project, and evidence that its design and maintenance did not degrade conditions essential to their migration toward spawning areas. However, allowing for climatic vagaries the species cannot reasonably be expected to migrate the creek any more often after construction of this flood control project than it does now, an unpredictable occurrence in the best of times in this climate. Favorable weather patterns could cause steelhead to appear in upper reaches of the drainage the first winter after completion of the project. On the other hand, a lengthy sequence of winters drier than average might prevent steelhead from swimming up Mission Creek for reasons which have nothing to do with the proposed project. Negative evidence should be discounted from this criterion.

10. CONCLUSIONS

The Corps of Engineers analyzed thoroughly the potential for impacts to steelhead which implementation of the proposed flood control project could cause. The possible need to relocate steelhead out of harm's way during construction and future channel maintenance, in a manner supervised and approved by the National Marine Fisheries Service and the California Department of Fish and Game, would constitute an unavoidable impact. Recognizing that, the Corps developed all feasible measures of mitigation in coordination with NMFS and other concerned resource agencies. With implementation of these various environmental commitments and structural mitigation measures, the proposed flood control project would have only temporary impacts to steelhead adults or smolts.

The proposed action will result in temporary degradation of habitat at the estuary, but only during the summer and fall after adults have tried to swim upstream and any smolt would normally have made their descent to the ocean. The next time steelhead would pass upstream through the estuary, during the following rainy season on the migration to upper elevations, those temporary effects would have been overcome by the larger estuary and the assorted refugia to provide hideouts for fish. When completed, the proposed design would also involve boulder clusters designed to blunt stream velocities and produce many small pools and runs which steelhead would exploit while moving upstream, additional protective ledges and bouldery linings of the creek's walls. Within a few years, plantings of native trees and shrubs on the finished banks would shade much of the creek.

Water should move through this final portion of Mission Creek at lower velocities than occur presently because the creek bed would be both wider throughout and have a soft bottom of natural materials. Sediment deposition and erosion would differ only marginally from existing patterns. The substrate in the estuary should become coarser with more gravelly places than now.

The design of the weir to control water movement at the split between the existing watercourse through the oxbow channel and the proposed bypass culvert would avoid completely any adverse impacts to migration of steelhead. At the strong recommendation of NMFS during meticulous planning discussions with hydraulic engineers from both agencies, all discharges less than 640 ft^3/sec would pass through the oxbow by virtue of the weir's design. Functional properties of the bypass culvert thus would not be a hazard to steelhead adults or smolt.

Maintenance procedures of the finished stream channel would occur between late summer and early fall. Aside from the possible need to relocate smolt seeking summer refuges at scour pools adjacent to bridges, the mosaic pattern of annual channel maintenance should not affect steelhead in any way. Pools formed beneath fish ledges or among the boulder clusters during the rainy season would be left untouched during channel maintenance.

The design and implementation of this proposed flood control project can be accomplished with minimal adverse and temporary effects to steelhead. The Corps anticipates design features and structural mitigation features should actually improve the conditions for steelhead migration through the lower reach of Mission Creek.

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Letters asserting phenotypic resemblances between salmonids in the Mission Creek watershed in May 1995 and southern evolutionary unit steelhead.

URBAN CREEKS COUNCIL

Santa Barbara Chapter: 5771 Leeds Lane, Goleta, Ca 93117 (805) 964-3105

May 25, 1995

Pat Higgins
Fisheries Biologist
791 8th Street, Suite N
Arcata, CA 95521

RE: DOCUMENTATION OF SOUTHERN STEELHEAD / RAINBOW TROUT (ONCORHYNCHUS MYKISS) IN RATTLESNAKE CANYON CREEK, SANTA BARBARA COUNTY

Dear Pat:

As a follow up to our survey of Rattlesnake Canyon Creek on Monday, May 22, 1995, and our conversation regarding southern steelhead in the creek, Jose Romero and I returned to sample the stream on Wednesday, May 24.

METHODS:
We sampled the creek using angling gear that consisted of a barbless fly and a barbless single hooked spinning lure. Captured fish were photographed and returned to the creek immediately.

OBSERVATIONS:
Two fish were landed. One measured approximately seven inches and the other one was approximately 12" to 13" (see photographs). Please note that the larger fish was captured in the pool that you and Carl Paige described as having excellent overhanging banks for the species. The pool is located upstream from the first trail crossing. An attempt was made to take scale samples from the larger fish, but the attempt was unsuccessful and the fish was released in a stressed condition. This steelhead had a hooked lower jaw. The smaller fish was captured in a 5'-6' deep pool that has fallen trees approximately five feet above the water surface and is located several hundred yards upstream from the first trail crossing.

Additionally, two fish measuring an estimated 12" each were observed in a pool approximately 100 yards upstream from the site where the largest fish was captured. Approximately six fish in the 8" - 10" range were observed in the creek between Las Canoas Road and the second trail crossing (above where we stopped on May 22). Approximately one dozen fish in the 6" to 8" range were also observed in this reach of the stream. Many of these fish hit at the spinning lure but were not captured. There are fish in almost every sizeable pool, especially upstream from the first creek crossing of the trail.

Please contact me at (805) 964-3105 if you have any questions.

Sincerely,

Brian G. Trautwein

Brian G. Trautwein, Executive Director
Santa Barbara Urban Creeks Council

cc: Carl Page, Fisheries Biologist
Jeffrey Lincer, Sweetwater Biologists
Hayley Lovan, Army Corps of Engineers
Jan Hubble, City of Santa Barbara

SANTA BARBARA URBAN CREEKS COUNCIL

Santa Barbara Office: 5771 Leeds Lane, Goleta , CA 93117 (805)964-3105
State Organization: 1250 Addison Street, #107C Berkeley, CA 94702 (510)848-2219

June 28, 1995

Pat Higgins
Fisheries Biologist
791 8th Street, Suite N
Arcata, CA 95521

RE: DOCUMENTATION OF SOUTHERN STEELHEAD / RAINBOW TROUT (ONCORHYNCHUS MYKISS) IN RATTLESNAKE CANYON CREEK, SANTA BARBARA COUNTY

Dear Pat:

As a follow up to my May 25, 1995 letter to you, I am enclosing the photographs of the twelve to thirteen inch steelhead that Jose Romero and I documented in Rattlesnake Canyon Creek on May 24, 1995.

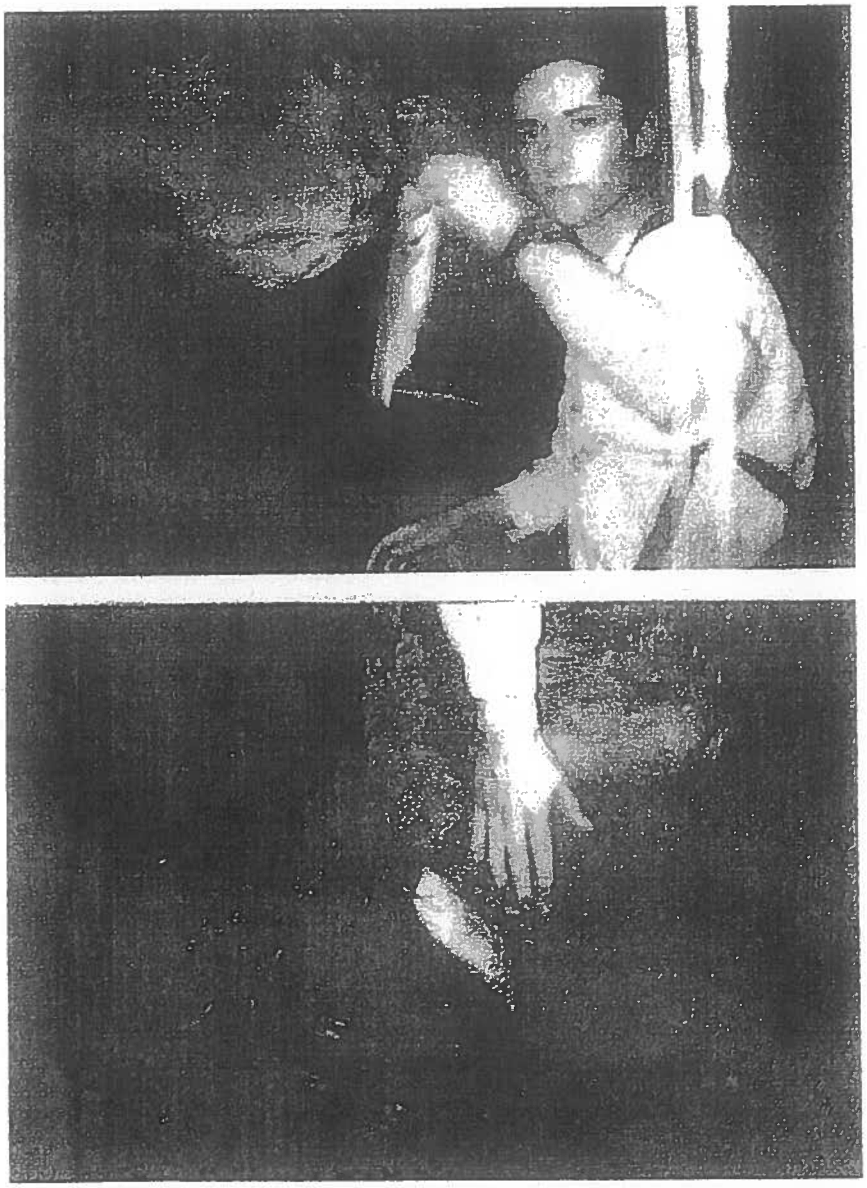
I expect Jennifer Neilson's genetic analysis of samples from Rattlesnake Canyon Creek to be completed soon. This should shed light on the origin of the fish in the creek, which is relevant to the flood control project proposed for Mission Creek downstream from Rattlesnake Canyon.

Sincerely,

Brian G. Trautwein

Brian G. Trautwein, Executive Director
Santa Barbara Urban Creeks Council

cc: Carl Page, Fisheries Biologist
Hayley Lovan, Army Corps of Engineers
Jan Hubble, City of Santa Barbara



Images scanned from original photographs which accompanied the letter of June 28, 1995.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Southwest Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213

AUG 2 2000

In Your Response
Please Refer to:

F-LB-00-23:KAJ

Robert E. Koplin
Department of the Army
Los Angeles District, Corps of Engineers
P.O. Box 532711
Los Angeles, California 90053-2325

Dear Mr. Koplin:

This document transmits the National Marine Fisheries Service's (NMFS) biological opinion based on NMFS' review of the Army Corps of Engineers' (ACOE) project to construct and the County of Santa Barbara (County) project to maintain a flood control channel on lower Mission Creek in the City of Santa Barbara, Santa Barbara County, California, and their effects on the Federally endangered Southern California Evolutionarily Significant Unit (ESU) of steelhead (*Oncorhynchus mykiss*) and its critical habitat in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.). Formal consultation for the Mission Creek flood control project was initiated on June 20, 2000.

The NMFS contact for this project is Korie Johnson. Please contact her at (562) 980-4199, if you have any questions regarding this consultation.

Sincerely,

Rodney R. McInnis

Rodney R. McInnis
Acting Regional Administrator

BIOLOGICAL OPINION

AGENCY: United States Army Corps of Engineers

ACTION: Construction and maintenance of flood control channel on lower Mission Creek, Santa Barbara County, California

CONSULTATION CONDUCTED BY: National Marine Fisheries Service, Southwest Region

DATE ISSUED: AUG - 2 2000

I. INTRODUCTION

Lower Mission Creek and its associated floodplain is highly constrained by residential and commercial development. Thus, streamflow often overtops the creek embankments during heavy storms, resulting in extensive flooding. The City has experienced approximately 20 damaging floods since 1900. In 1995, flooding resulted in extensive damage to City and private property, numerous evacuations of residents living within the immediate floodplain of Mission Creek, and transportation delays. Due to the recurrent flooding, the City of Santa Barbara (City) and the Santa Barbara County Flood Control District (County) requested that the Army Corps of Engineers (ACOE) assist the City in finding a solution to the flooding problems. In response to this request, ACOE has proposed the construction and maintenance of a flood control channel along the lower 1.2 miles of Mission Creek in the City of Santa Barbara, Santa Barbara County, California.

During early planning stages of this project, NMFS staff attended multiple site visits and agency coordination meetings. During these early meetings, NMFS informed the ACOE of steelhead concerns regarding the proposed project. On December 21, 1999, NMFS received a feasibility report for the ACOE's project along with a request for formal consultation. At that time, however, completed descriptions of construction and maintenance activities were not available. Thus, NMFS requested further project information, including detailed project plans, proposed maintenance activities, hydraulic analyses, cross sections and profiles of the project reach, and an analysis of possible effects to steelhead. At a June 7, 2000 meeting, ACOE presented the requested information and asked for further input from NMFS. On June 20, 2000, the final Biological Assessment, project description and hydraulic analyses were received by NMFS and formal consultation on endangered steelhead and steelhead critical habitat was initiated in accordance with section 7 of the Endangered Species Act (ESA).

This biological opinion, therefore, represents formal consultation for the Southern California ESU for the Federally endangered steelhead and for designated steelhead critical habitat. A complete administrative record is on file at NMFS

Southwest Region Office (501 W. Ocean Blvd., Suite 4200, Long Beach, CA 90802-4213).

II. Description of the Proposed action

Introduction

The Federal action involves the Army Corps of Engineers (ACOE) constructing a flood control channel along 5380 linear feet (ft) of lower Mission Creek beginning at the Canon Perdido Street Bridge and continuing downstream to the Cabrillo Boulevard Bridge within the estuary (Figure 1). The purpose of the project is to increase the capacity of lower Mission Creek from 1050 cubic feet per second (cfs) to 3,400 cfs in order to provide flood protection up to a 20-year storm event. Once the project is constructed, the County would be responsible for maintaining the channel at the design capacity.

Action Area

The action area for the ACOE lower Mission Creek flood control project includes approximately 5500 linear feet of Mission Creek, including the channel invert and both embankments from Canon Perdido Street down to Cabrillo Boulevard near the mouth. Mission Creek is part of the Southern California Evolutionarily Significant Unit (ESU) for the Federally endangered steelhead (*Onchorynchus mykiss*) and was designated by NMFS as steelhead critical habitat on February 16, 2000.

Proposed Action

<u>Overview</u>

Generally, the ACOE project involves widening the channel, lining the embankments with vertical concrete walls, streamlining the bedslope, installing a bypass culvert near the Highway 101 crossing (referred to as the oxbow), and replacing four bridges (Ortega Street, Cota Street, De la Vina Street, and Mason Street Bridges) in order to accommodate increased channel capacity (Figure 1). Five properties along the creek channel will be purchased by the ACOE, and existing buildings on those properties will be removed for the widening of the creek. The remainder of the parcels would be used in the creation of isolated park areas, referred to as habitat expansion zones. The parcels range in size from 0.03 to 0.52 acres. Native trees, including western sycamores, cottonwoods, and coast live oak will be planted in these parks and along creek embankments to provide an expanded riparian corridor.

In order to widen and stabilize the channel, ACOE will remove existing bank stabilization structures, excavate embankments, and install hard bank slope protection. A total of 82,000 cubic yards of material will be excavated from the

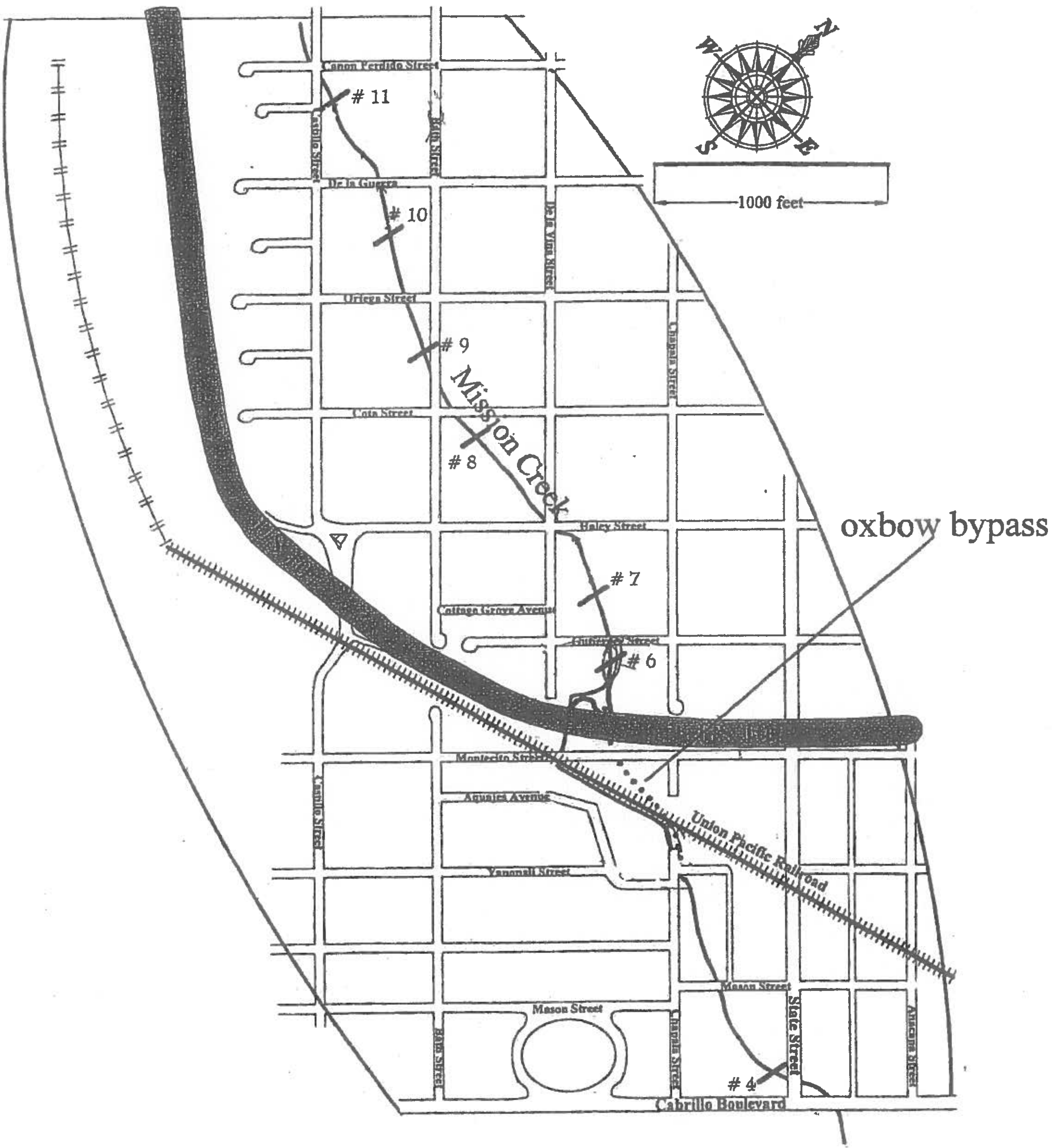


Figure 1. Project area for Army Corps of Engineers Flood Control Project along lower Mission Creek in the City of Santa Barbara, Santa Barbara County, California. Numbered lines indicate locations of representative cross sections used in hydraulic analyses.

creek channel and embankments. Only the retaining wall located on the eastern bank upstream of the De la Guerra Bridge and the hard bottom channel and mortared sandstone walls (approximately 940 linear ft) located between the upstream side of Highway 101 and the downstream side of Chapala Street, referred to as the "oxbow," will be left in place. Approximately 420 linear ft of existing cement channel located between Haley and De la Vina Street bridges will be removed.

Hard bank slope protection will consist of either complete vertical cement walls or combination vertical toe wall and vegetated riprap sideslope (Table 1). Walls will be constructed in one of two methods, depending on their proximity to existing structures. An inverted "T" footing would be applied in areas where sufficient rights-of-way are available. In areas with limited rights-of-way, a pier footing construction would be used. In general, the toe wall height will be half the depth of the channel. The remaining top half of the bank will be the riprap side slope. Between successive bridges the toe walls will be of constant height and therefore the height of the riprap slope could vary somewhat. The side slope will be constructed by backfilling the vertical wall with riprap at a maximum slope of 1.5:1. The riprap will be covered with topsoil and planted to establish a healthy riparian corridor. Short cylinders will be placed in between the riprap to allow planting of native trees and vegetation. Following project implementation a total of 2395 linear feet will be vertical wall and 4490 linear feet will be vertical wall-riprap sideslope.

Table 1. Overview of modifications to lower Mission Creek channel and embankments.

Reach	Upstream Extent	Proposed Treatment Left Bank	Proposed Treatment Right Bank	Proposed average depth	Proposed width (channel invert)	In-Channel Modifications
1	Canon Perdido	Wall/riprap Vertical wall	Wall/riprap Vertical wall	7.5	42	Boulder cluster, fish baffles & ledges
2	De la Guerra	Wall/riprap Vertical wall	Wall/riprap	9	42	Boulder cluster, fish baffles & ledges
3	Ortega	Wall/riprap	Wall/riprap	9	42	fish baffles
4	Bath	Vertical wall	Access ramp	9	42	fish baffles & ledges
5	Cota	Wall/riprap Vertical wall	Wall/riprap Vertical wall	9	42	
6	Haley-De la Vina	Wall/riprap Vertical wall	Wall/riprap	9	50	Boulder cluster, fish baffles & ledges
7	Gutierrez	Wall/riprap Culvert inlet	Wall/riprap Riprap	9	50	Boulder cluster
8	Highway 101	Bypass culvert Oxbow	Bypass culvert Oxbow		33-40 (no change)	Boulder cluster
9	Chapala/ Yanonali	Wall/riprap Vertical wall	Vertical wall	7.5	60	fish baffles & ledges

10	Mason	Wall/riprap Vertical wall	Vertical wall	8	60	fish baffles, vertical ridges, ledges
11	State to Cabrillo	Wall/riprap	Wall/riprap	9	60	fish baffles, vertical ridges

An overflow box culvert will be installed at the oxbow. During this stretch, the creek makes several sharp turns as it crosses Highway 101, the Montecito Street Bridge, and Union Pacific Railroad. The culvert will have two 15 ft wide by 6 ft high boxes and will follow a direct path between the Gutierrez and Chapala Street Bridges. A weir structure will be built at the inlet of the culvert to direct all flows up to 640 cfs through the oxbow channel. If flows increase above 640 cfs, the weir will split flows between the overflow culvert and the oxbow channel. At a design flow of 3400 cfs, 2350 cfs will be directed through the culvert and 1050 cfs will flow through the oxbow. The weir will be approximately 3 ft higher than the channel invert and will be 240 ft in length, extending about 22 ft laterally into the channel.

Fish habitat

ACOE has incorporated a number of measures into the design of the flood control channel to provide cover and resting areas for steelhead. In order to dissipate high velocities and allow for improved migration of steelhead, the creek channel will be lined with riprap (up to 15 inches in diameter) at three locations. At two locations, clusters of 6 to 9 large boulders will be keyed into the riprap within the channel to break up the principal currents. Boulders will be 3 to 4 ft in diameter and placed 5 to 8 ft apart. Individual boulder fields will be 300 ft in length. One will be centered at the De la Guerra Street Bridge (starting150 feet upstream and running 150 feet below the bridge). The second would be located from 150 feet upstream of the Gutierrez Street Bridge downstream to the start of the oxbow. The outlet of the overflow culvert will be armored with riprap to prevent scouring of the streambed, but will not have boulder clusters.

ACOE will also incorporate structures into the vertical concrete walls to provide cover, shade and resting areas for steelhead. Between Mason Street and Cabrillo Boulevard, molded ridges extending vertically along the wall will lower water velocity and create localized eddy currents, providing refuge for small fish. These ridges will mostly benefit gobies, but could provide cover for young-of-the-year steelhead as well. Ridges will begin at the bottom of the formed wall and continue vertically to the ordinary high water mark, a height of approximately 8 ft at the estuary. They will vary in length from 1 to 4 feet, and will be 6 inches wide and extend 3 inches out from the wall. The space between successive ridges will be 12 inches.

In addition, artificial overhangs will be cantilevered from the wall extending 2 ft into the channel. The ledges will be 6 inches thick and approximately 50 ft long.

Within the estuary, ledges will be built approximately 10-20 inches above the invert of the stream so that water will cover the ledges at all times except at the lowest low tides. Double rows of coarse boulders (baffles) will be keyed into the channel between the overhangs along the creek walls. Spaces in between the rocks will provide additional cover and heterogeneity to the channel invert. These boulder side baffles will extend 5 ft into the channel and project 18 to 24 inches above the creek invert. A space of approximately 5 ft to 8 ft will be left between pairs of rocks to facilitate periodic removal of sediment.

The combination of all three of the above features will be incorporated into the channel and channel walls within the estuary between Mason and Cabrillo bridges. In this estuarine section of the creek, boulders would be packed together as tightly as possible. Features will be offset, so that ledges on one bank of the creek face ridges and boulders on the opposite bank of the creek. This will result in a total of 380 linear ft of fish ridges and boulders, and 240 linear feet of over hanging ledges on the eastern bank of the creek, and 360 linear feet of ridges and boulders, and 300 linear ft of ledges on the western bank of the creek.

Upstream of the Mason Street Bridge, overhangs will be placed at locations where currents are expected to impinge against the wall and scour persistent pools under the ledges. Four ledges will be built along the eastern bank for a total of 200 linear ft. Five ledges will be built along the western bank for a total of 250 linear ft. Ten rock baffles will be constructed in lower velocity sections of the creek, with individual baffles extending from 150 to 200 ft in length. A total of approximately 1400 linear ft of rock baffles will be installed; 675 linear ft on the east bank and 725 linear ft along the right side.

Construction

Prior to any construction activities within a given project reach, a qualified biologist shall survey for the presence of steelhead. If steelhead are present, a qualified biologist shall net and relocate them to suitable habitat within Mission Creek. Methods for steelhead capture and relocation are discussed below.

Construction activities shall begin at the downstream extent of the project area and progress upstream. Project construction is expected to last 3 years, although delays due to weather or mechanical failure could prolong the project for an additional 1 to 2 years. For construction within the estuary from Cabrillo Boulevard up to Yanonali Street, all construction within the creek will occur between June 1 and December 1 of any given year. Upstream of the estuary work could begin as early as April 15, but only if Mission Creek does **not** have continuous surface flow between Oak Park and the upper extent of the project area. If surface flow persists, construction will only occur after June 1. Only one side of the channel will be isolated and dewatered at any given time to allow normal tidal flushing and unimpeded stream flows within the other half.

In order to dewater the work area within the estuary, a temporary barrier will be installed down the centerline of the proposed channel (not the existing centerline) by driving sheet piles. Pile driving equipment working from the top of the eastern bank will drive the sheet piles near the existing east bank. Barriers will then be installed at the upper and then the lower end of the proposed centerline to create an enclosure on one side (on the east side first) of the creek. The enclosure will be seined by qualified biologists to remove any fish trapped within the area. Once all fish are removed, pumps fitted with ½ inch mesh screens will be used to pump water out of the enclosure. Biologists will continue to monitor the enclosure while water is pumped out in order to rescue any fish that were missed during the initial seining. Construction activities, including excavation and wall construction will then be completed within the dewatered area. The ACOE will complete construction along one side of the estuary, between Cabrillo Boulevard and Yanonali Street, in a single segment, thus avoiding the complications of repetitive de-watering processes in multiple short segments of the estuary. Once construction is completed within the dewatered work area, the downstream and upstream barriers will be removed and installed on the opposite side of the channel. The new enclosure will be surveyed and dewatered as described above, and construction within the newly dewatered area will be completed.

Prior to construction upstream of the estuary stream flow will be diverted through 2 culverts set into a temporary pilot channel that will be dug into the channel invert. The combined capacity of the two culverts will be at least 40 cfs. Culverts will be smooth along their inner walls and at transitions between segments. Following construction, the streambed will be shaped according to design elevation and slope. A lowflow channel will be constructed through the project area and the channel invert will be restored using substrate representative of natural conditions (type and size) in lower Mission Creek. Following restoration of the channel invert, the diversion will be removed. This sequence of activities will continue upstream until the project is finished.

Revegetation

Of the 7310 linear feet of stream bank within the project area (excluding bridges and the 940 ft length of the oxbow) , 2100 linear feet (29%) have natural soft surfaces, while the remaining 5210 linear feet (71%) have some form of revetment. Vegetation grows along all of the embankments with soft surfaces and through cracks within the hard surfaces. The vegetation present is dominated by invasive non-native species, such as giant reed (*Arundo donax*). As much as is practicable, large native trees that are present will be avoided and saved. When finished, the combination toe-wall and riprap slope would occupy 4740 linear feet (65%) while full-height vertical walls would remain along 2510 linear feet (35%) of the stabilized banks. Following construction the riprap sideslopes and habitat expansion areas will be replanted with native vegetation. A minimum of 120 trees will be planted on the sideslopes and a minimum of 330 trees will be planted in the habitat expansion areas. Exact tree species have not been determined but will include western sycamore, Fremont's cottonwood, black cottonwood, coast live oak, white alder, California bay, Arroyo willow, wax myrtle, Mexican elderberry, squaw bush, and blackberry. In addition, sideslopes and habitat expansion areas will be revegetated with native shrubs and grasses by hydroseeding. A temporary, above ground irrigation system will be installed to irrigate planted vegetation for at least 3 years. Any dead or dying trees and shrubs shall be replaced immediately (except during midsummer). Non-native vegetation will be controlled, by brushing or herbicide, and/or removed.

In order to insure success of revegetation efforts, the ACOE has developed a detailed vegetation monitoring plan. Riparian corridors will be monitored every 3 months during the first year following construction, every 4 months during the second year, and every 6 months during the third, fourth and fifth year. Following the fifth year, the County will incorporate all monitoring and maintenance activities into their annual streambed maintenance activities. Growth rates of trees and shrubs will be documented for 5 years. If plants do not meet pre-determined growth rates, growing conditions will be improved using fertilization or increased irrigation. Success of revegetation will be defined by the following:

1. A minimum of 90% survival of planted vegetation after five years.
2. A minimum of 40% survival of shrubs after five years. All shrubs should attain at least 50% the height and breadth typical of each in this climate.
3. A minimum of 50% of the riparian corridor should be occupied by willows, 7 to 10 ft in height, after five years.

Maintenance

The County will be responsible for maintaining the project reach at its design function and form. All maintenance activities will be accomplished between August 1 and October 31 of any given year. Maintenance activities could include sediment and vegetation removal, repair of concrete walls, culvert, riprap, side baffles, and boulder fields, and upkeep of the riparian corridor. All maintenance activities will be documented in the County's Annual Maintenance Plan.

Sediment and vegetation will be cleared in any areas where the design capacity of the creek is lowered by 15% or more. Prior to any maintenance activities a qualified biologist will survey project areas and relocate any steelhead found there to suitable habitat within Mission Creek. Methods for steelhead capture and relocation are discussed below. Sediment will be removed using a loader or road grader working from within the channel. Vegetation will be removed by brushing, clearing, or spraying. Removal will be completed in a mosaic pattern so that only one side of the creek shall be cleared during any given year. To achieve the mosaic pattern, a swath, half the width of the channel, will be cleared along one side of the creek for a distance of approximately 100-200 ft. Activities within the 100-200 ft downstream of this swath will then be confined to the opposite half of the creek. This pattern will continue downstream until maintenance activities are completed. The areas of the creek that are not excavated or cleared would be mowed to suppress woody vegetation, while allowing herbaceous vegetation to grow.

Following any clearing activities, a low flow channel will be constructed or re-established so that streamflow passes close to areas where cover and shading are available throughout the dry season. Removal of sediment and/or mowing of vegetation would likely occur once every 3 years, depending on climatic conditions. However, a sequence of large storm could necessitate maintenance activities to be performed as often as once a year. Areas of clearing will be reversed between years so that no one area is excavated or completely cleared two years in a row unless necessary to remove sediments deposited by unexpectedly large storm events in order to restore design capacity.

Sediment will also be removed from among boulder clusters and side baffles as needed to prevent them from being buried. Any woody vegetation, such as giant reed or salt cedar, will be removed from within the boulder clusters using hand tools or herbicides. Low growing herbaceous plants will be left in place.

Concrete structures, such as vertical walls, bridge abutments, ledges or culverts, will be inspected annually for cracking, chipping, breaking, sedimentation, uplift or scour. Repair of these structures will occur as needed. If dewatering is necessary to complete repairs, methods described above will be utilized. Any boulders that are displaced by currents will be pushed back into a suitable spot and reset. The County will also inspect and repair vegetated side slopes to maintain the riparian corridor. Riprap and topsoil will be replaced as necessary.

<u>Fish Relocations</u>

Fish relocations will be done in conjunction with, or at the direction of NMFS and/or California Department of Fish & Game (CDFG) using approved techniques. Steelhead will be caught with nets and moved to suitable habitat within Mission Creek and its major tributaries only; no fish will be relocated outside of the creek system. Specific relocation sites will be determined in conjunction with NMFS and CDFG prior to any relocation activities. Relocation will be conducted in a manner that mimics their natural migration patterns. Juvenile fish that appear to be smolting will be moved downstream to suitable habitat while juveniles that appear to be over-summering will be moved upstream to suitable habitat.

Once caught, fish shall be immediately placed in a 5-gallon bucket or 45-gallon ice chest filled with water from the immediate area. Oxygen will be diffused into the container while fish are present. Fish will be immediately transported to the relocation sites and released. Once fish are released, the biologist shall observe the relocated fish, document their behavior for at least one hour, and then return the following day to make additional observations of the fish presence and behavior.

Upon completion, a report shall be submitted to NMFS documenting all relocation efforts. The report shall include the following information: 1) location of the fish prior to relocation, 2) number of fish relocated, 3) estimated size of fish relocated, 4) general observations of fish condition, 5) time fish was netted, 6) time for transport, 7) relocation site, 8) time of release, and 9) observations made after relocation.

Monitoring

The ACOE shall develop a monitoring plan, to be approved by NMFS, to ensure that flow conditions within the flood control channel match those predicted during pre-project analyses. The plan will include measures to monitor continuous flow conditions and benchmark water depths and velocities. Monitoring will also include observations of how the rock baffles are interacting with the lowflow channel and any opportunistic observations of steelhead migration. If data collected during monitoring indicate that conditions are not suitable for upstream steelhead migration, the ACOE will modify the channel to provide passage.

III. STATUS OF THE SPECIES

INTRODUCTION

Based on the location, timing, and operations of the proposed project, endangered steelhead and designated steelhead critical habitat could be adversely affected by project activities. Adverse impacts could occur due to stream diversion, channel and embankment excavation, vertical wall construction within the creek channel and riparian corridor, and future maintenance of the flood control channel within Mission Creek.

STATUS

Steelhead, the ocean-going form of rainbow trout, are native to Pacific Coast streams from Alaska south to northwestern Mexico (Moyle 1976; National Marine Fisheries Service 1997). Wild steelhead populations in California have decreased from their historic levels (Swift et al. 1993; National Marine Fisheries Service 1997). This decline prompted listing of the Southern California ESU of steelhead as endangered on August 18, 1997 (National Marine Fisheries Service 1997).

The relationship between resident rainbow trout and steelhead trout in most areas is complicated and poorly understood. Although often separated by a natural or man-made barrier to migration, the two forms can interbreed. In addition, resident trout can produce anadromous offspring and vice versa

(National Marine Fisheries Service 1996; Shapovalov and Taft 1954). Anadromous individuals also are capable of residualizing when access to the ocean is blocked, and then returning to anadromy when access is restored. The listing for the Southern California ESU includes all naturally spawned populations of steelhead and their progeny residing below long-term barriers (National Marine Fisheries Service 1997). Adults that have migrated to the ocean usually are larger and more silvery than adult resident trout due to changes in diet and physiological characteristics necessary for ocean survival (Shapovalov and Taft 1954). It is difficult, however, to distinguish juvenile rainbow trout from juvenile steelhead trout without genetic analyses.

The Southern California ESU extends from the Santa Maria River in Santa Barbara County to Malibu Creek in Los Angeles County (inclusive). In the Southern California ESU, there are four major rivers: Malibu Creek and the Santa Clara, Santa Ynez, and Ventura Rivers, and numerous creek drainages that provide important habitat for steelhead. Historically, steelhead probably utilized many coastal streams and rivers in Southern California. For example, historical records document steelhead utilization of the Santa Maria and Santa Ynez Rivers and their major tributaries, and Gaviota, Arroyo Hondo, Venadito, Las Flores Canyon, El Capitan, Corral, Refugio, Atascadero, Mission, Montecito, Carpinteria, and Rincon Creeks (Henke 1998; Swift et al. 1993, Titus et al. in press) the Ventura River, Santa Clara River, Big Sycamore Canyon Creek, Malibu Creek and Topanga Canyon Creek (Busby et al. 1996; Swift et al. 1993).

General causes for the decline of steelhead abundance throughout Southern California include destruction and modification of habitat, point and non-point source water pollution, water withdrawals and diversions, dam operation and maintenance, over-utilization of habitat for recreational purposes, recreational harvest, and natural factors (National Marine Fisheries Service 1997). Even in less urbanized areas, agricultural land-use has led to decreased water quality, reduced vegetation and increased erosion and sedimentation.

In addition, access to many waterways, including critical spawning and rearing habitat, is constrained by manmade barriers (e.g., dams, culverts, road crossing structures, flood control structures, and channelization) and seasonal fluctuations in hydrological conditions. Complete barriers block the use of the upper watershed, often the most productive spawning and rearing habitat in the system. Temporal barriers block passage during certain flow conditions and delay migration. Salmonids generally expend 80% of their stored energy during normal upstream migration to spawning areas (Lauman 1976). Any additional delays can force these fish to use up limited energy reserves, which can significantly impair spawning success. Partial barriers block smaller or weaker fish of a population, limiting the number of fish able to reach spawning grounds. Thus, man-made structures that act as barriers to steelhead passage can have significant impacts on production.

Estimates of run sizes for the major rivers in the Southern California ESU are as follows: Santa Ynez River, <100; Ventura River, <200; Santa Clara River, <100; Malibu Creek, <100 (Busby et al. 1996). These run estimates are not based on survey data and cannot be used to quantitatively assess population abundance throughout the entire Southern California ESU. Although abundance estimates are limited, surveys document the continued existence of steelhead within the Santa Ynez River and some of its tributaries (Busby et al. 1996), Arroyo Hondo Creek (Busby et al. 1996), Gaviota Creek (Reavis 1991; Virginia Gardner, CA State Parks Dept., pers. comm., 1998), Maria Ygnacio Creek (M. Cardenas, CDFG, pers. comm., 1999), Mission Creek (CDFG 1996), Montecito Creek (K. Johnson, NMFS, pers. obs., 1999), San Ysidro Creek (K. Johnson, NMFS, pers. obs., 1999), Carpenteria Creek (CDFG 1996), Ventura River (Reavis 1991), Santa Clara River (Reavis 1991; Nehlsen et al. 1991; CDFG 1996), and Malibu Creek (Reavis 1991; Nehlsen et al. 1991). Information from these surveys indicate, however, that Southern California steelhead numbers are very low and that the population is in danger of extinction.

LIFE HISTORY AND HABITAT REQUIREMENTS

The major life history stages of steelhead involve freshwater rearing and emigration of juveniles, upstream migration of adults, spawning, and incubation of embryos (Shapovalov and Taft 1954; Moyle 1976; Cederholm and Martin 1983; Barnhart 1991; Meehan and Bjornn 1991; Busby et al. 1996; National Marine Fisheries Service 1997). Steelhead young rear in freshwater for one to three years before migrating to the ocean, usually in the spring, where they may remain for up to four years. Steelhead grow and reach maturity at age two to four while in the ocean. The majority of adults immigrate to natal streams for spawning, however some individuals stray to streams other than their natal one (Quinn 1993). This straying serves as one mechanism for dispersal and colonization of new or historical habitats or streams (Wood 1995). Most adults immigrate to freshwater during October to March. Adults may migrate several miles, hundreds of miles in some watersheds, to reach their spawning grounds. Although spawning may occur during December to June, the specific timing of spawning may vary a month or more among streams within a region. Steelhead do not necessarily die after spawning and may return to the ocean, sometimes repeating their spawning migration one or more years.

When spawning, female steelhead dig a nest in the stream and then deposit their eggs. After fertilization by the male, the female covers the nest with a layer of gravel; the eggs incubate within the gravel pocket. Hatching time varies from about three weeks to two months depending on water temperature. The young fish emerge from the nest about two to six weeks after hatching.

Habitat requirements of steelhead in streams generally depend on the life history stage (Cederholm and Martin 1983; Bjornn and Reiser 1991). Streamflow volume, water temperature, and water chemistry must be appropriate for adult immigration and juvenile emigration (specific habitat requirement data can be found in Bjornn and Reiser 1991). Low streamflow, high water temperature, physical barriers, low dissolved oxygen, and high turbidity can delay or halt upstream migration of adults and timing of spawning, and downstream migration of juveniles and subsequent entry into estuary, lagoon, or ocean habitats. Suitable water depth and velocity, and substrate composition are the primary requirements for spawning, but water temperature and turbidity are also important. Dissolved oxygen concentration, pH, and water temperature are factors affecting survival of incubating embryos. Fine sediment, sand and smaller particles can fill interstitial spaces between substrate particles, thereby reducing water-flow through and dissolved oxygen levels within a nest. Juvenile steelhead require living space (different combinations of water depth and velocity), shelter from predators and harsh environmental conditions, food resources, and suitable water quality and quantity, for ontogeny and survival during summer and winter. Young-of-the-year and yearling steelhead generally use riffles and runs (e.g., Roper et al. 1994) during much of a given year where these habitats exist. Young-of-the-year and older juveniles may seek cover and cool water in pools during the summer (Nielsen et al. 1994).

The information used to describe steelhead life history is largely based on northern populations. Specific data on the life history of southern steelhead are lacking and northern populations provide a general description of steelhead life history and habitat requirements. There are some differences between the two populations. For example, annual rainfall and stream flow is considerably lower and more variable in Southern California than in regions to the north (Moore 1980; Titus et al. in press). Southern California steelhead are often subject to higher water temperatures, increased duration of sand berms across the mouths of streams and rivers, and complete dewatering of some reaches of these streams. These factors influence the migration and life history of Southern California steelhead, and could result in differences between the life history of southern and northern populations. At this time, however, data to support or describe these differences is unavailable. Therefore, NMFS will consider the life history aspects of northern and southern populations comparable for the purpose of this biological opinion.

Critical Habitat

Critical habitat for the Southern California Evolutionarily Significant Unit for the Federally endangered steelhead, published on February 16, 2000 (50 CFR 226; NMFS 2000), includes all freshwater and estuarine areas, including adjacent riparian zones, accessible to listed steelhead in coastal river basins from the Santa Maria River to Malibu Creek (inclusive). Freshwater critical habitat includes all waterways and substrates below longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). Essential features of steelhead critical habitat include adequate substrate, water quality, water temperature, water velocity, cover/shelter, flood, riparian vegetation, space, and safe passage conditions. Excluded from designated critical habitat are former anadromous areas above the following dams: Vaquero Dam on the Cuyama River; Bradbury Dam on the Santa Ynez River; Casitas Dam and Robles Diversion on the Ventura River; Santa Felicia Dam on Santa Clara River; and Rindge Dam on Santa Monica Bay.

IV. ENVIRONMENTAL BASELINE

WATERSHED OVERVIEW

Mission Creek flows from the south side of the Santa Ynez Mountains through the City of Santa Barbara where it meets the Pacific Ocean. The creek and its main tributary, Rattlesnake Creek, drain approximately 11.4 square miles. Average gradients in the foothill area are about 1000 ft per mile in contrast to the gradients of 150 ft per mile in the lower reaches of the creek. Other than informal surveys, comprehensive data on steelhead abundance in Mission Creek are unavailable.

Mission Creek can be divided into two sections: the upper watershed within the Santa Ynez Mountains and foothills, and the lower section beginning at the foothills and extending down through downtown Santa Barbara to the ocean. A reasonable location marking the transition between these two areas is the Santa Barbara Mission located 4 miles upstream from the Pacific Ocean. Upper Mission Creek consists of mostly natural habitat with extensive riffle-pool complexes and healthy, developed riparian vegetation dominated by western sycamore, cottonwood, coast live oak, and willow trees. This area of the Mission Creek watershed contains the majority of suitable steelhead spawning and rearing habitat within the system. Although no systematic surveys have been completed, trout have been observed repeatedly upstream from the Mission on both Mission and Rattlesnake Creeks. In June 1999, NMFS biologists walked portions of these areas and observed 4 to 5 trout near the Natural History Museum, 9 large and numerous small trout on Rattlesnake Creek, and tens to hundreds of 1 to 4 inch young-of-the-year (YOY) throughout lower Rattlesnake Creek. Two adults and several YOY were observed at a large scour pool at base of Foothill Bridge and Los Olivos Bridge. These two bridges have concrete aprons that could act as partial impediments to steelhead migration. Trout were observed again in the above areas in July 2000.

Barriers on both Mission and Rattlesnake Creeks block steelhead passage to the highest extent of the watershed. The Botanical Gardens on Mission Creek, located approximately 1 mile upstream of the confluence with Rattlesnake Creek, has an historical dam with aquaduct that stands over 15-20 ft tall. This structure is a complete barrier to steelhead upstream migration. Approximately 2000 ft upstream of this dam is a County owned debris basin that was built in 1964 following the Coyote Fire. This debris basin has a dam associated with it that is a total barrier to steelhead migration. On Rattlesnake Creek, approximately 1.6

miles upstream with the confluence with Mission Creek, there is another debris basin that was also built in 1964 after the Coyote Fire. Again, this basin has an associated dam that impedes migration of steelhead. CDFG biologists have observed trout upstream of these barriers. It is possible that these trout are descendants of residualized steelhead that would demonstrate anadromy if access to the ocean were restored. It is also possible that these trout, whether descendants of resident or steelhead trout, are producing anadromous offspring that are either residualizing above the barriers, or successfully migrating downstream through the various barriers during optimal flow regimes.

Natural habitat persists into lower Mission Creek, but this reach is highly confined due to residential and commercial development. Two reaches within this area have been lined with concrete: a 0.3 mile section and 0.8 mile section both built by the California Department of Transportation in conjunction with the Highway 101 Freeway. Under high flow conditions, velocities increase within these channels and can result in passage impediments. At low flow conditions, streamflow spreads out into a thin layer across the smooth, flat channel. These shallow depths can also act as impediments to steelhead migration. Although good habitat is more limited in lower Mission Creek, steelhead have been observed in some areas. In spring 2000, a CDFG biologist estimated approximately 100-200 trout (6-8 inches in length) in large pools in Oak Park, located approximately 2.6 miles upstream from the ocean.

Flow characteristics are highly variable in Mission Creek and are reflective of the variability in rainfall. Average total annual rainfall between October 1983 and May 2000 in Santa Barbara County is 19.94 inches. The majority of rainfall occurs in December, January, February and March, but is still unpredictable and sporadic between years. Within the above time period total monthly rainfall between December and March ranged from 0 to 20.86 inches per month. Because of the unpredictable timing and magnitude of rainfall, and thus streamflow, flow conditions that allow for steelhead migration can be limited. Suitable rearing habitat is also limited by streamflow in Mission Creek as large sections of lower Mission Creek go dry during summer and fall of most years. It is unknown whether the juveniles observed within and downstream of the project site are migratory steelhead or resident trout, but because they were found in a coastal stream with downstream access to the ocean, they are assumed to be steelhead by NMFS.

FACTORS AFFECTING SPECIES IN ACTION AREA

The action area begins just downstream of the longer Caltrans channel at Canon Perdido Street. Within the action area, Mission Creek parallels Highway 101 and then turns to the west in an area known as the oxbow. This section of Mission Creek has been altered extensively by manmade structures. Starting at the oxbow, Mission Creek flows through a 140 ft long box culvert (Highway 101), a 60 ft section lined by riprap and wing walls, a 60 ft wide box culvert (Montecito

Street), a 20 ft section lined with wing walls, a 70 ft section beneath the Union Pacific Railroad tracks and then through a 530 ft section lined with historic sandstone. A 15 inch high sill exists at the downstream end of the sandstone lining (Yanonali Street). This location marks the change from freshwater to brackish water at the upstream extent of the estuary.

In addition, many short reaches of lower Mission Creek are lined with various bank stabilization treatments installed by the City and/or private landowners. Typical treatments include piled stone, sacked concrete, gabions, vertical cement walls, and pipe and wire revetment. These treatments cover approximately 5240 linear ft of embankments (including both banks) and have reduced habitat for fish and wildlife and caused the loss of riparian vegetation. Vegetation that has persisted is highly disturbed with extensive growth of non-natives. The majority of vegetation along embankments is influenced by residential and commercial landscaping.

The County routinely clears sediments and vegetation that accumulate within lower Mission Creek to maintain flood capacity. Vegetation that grows within the channel is mowed and sprayed with herbicides by the County to maintain flood capacity of the channel. Accumulated silts are cleared using loaders. Following flood control maintenance, the channel is often a flat, trapezoidal channel devoid of heterogeneity.

The downstream extent of Mission Creek, extending approximately 1060 linear ft upstream from the mouth of the creek, is tidally influenced. The estuary flows under State Street in the City of Santa Barbara and empties in the Pacific Ocean near Steam's Wharf and the Santa Barbara Marina. The wharf and beach in this area are used heavily for recreational activities. In the past, the City of Santa Barbara has relocated the mouth entrance to avoid the debris washing into the Marina. The City also artificially breaches the mouth of Mission Creek during summer months to avoid stagnant water, which can be unsightly or have an unpleasant odor, in an area of high tourist use.

STATUS OF SPECIES IN ACTION AREA

There are anecdotal observations of juvenile trout in scour pools in lower Mission Creek. Most of the pools that persist during summer months are located in the lower portion of the project area, and are formed due to scouring below and behind hard bank lining. It is likely that juveniles found in these pools have been washed or actively move downstream and are then unable to move back upstream to more suitable rearing habitat when flows decline rapidly in early summer.

In March 2000, a 27 inch female steelhead spawned within the project area, just downstream of De la Guerra Street. The female created four redds, two of which were fertilized by a smaller male steelhead. It is probable that the steelhead moved into Mission Creek following a significant rainfall event in late February. And then, as is common for Mission Creek, flows dropped too quickly to provide sufficient water depth at the 0.8 mile Caltrans channel for the female to continue moving upstream to good spawning habitat. If this was the case, then the female was forced to spawn within the upstream reach of the project area, which did not provide optimal conditions for spawning. After spawning, the male migrated downstream, presumably to the ocean. The female did not survive, nor did any of the fertilized eggs.

On May 4, 2000, ACOE and US Fish and Wildlife Service staff observed 2 juvenile steelhead (6-8 inches in length) near the Mason Street Bridge in the Mission Creek estuary. These fish were probably smolts making their way to the ocean, and could have been some of the same fish seen by CDFG at Oak Park a month or so earlier. Thus, there exists the potential for juvenile steelhead to be present within and downstream of the project area during project activities. Furthermore, fish passage must be maintained through the project area for downstream migration of smolts and upstream movement of juveniles and adults.

V. Effects of Project Action

Introduction

Generally, possible effects of the project action on steelhead and their proposed critical habitat are those associated with construction and maintenance of the flood control channel, including excavation of the creek bed and embankments, installation and maintenance of vertical concrete walls and structures, continued excavation and removal of woody debris and vegetation as needed, and relocation and monitoring of steelhead. Anticipated effects involve possible take in the form of capture, trap, harm, harassment, injury, and/or mortality of juvenile steelhead present in the project area, loss and alteration of instream and riparian habitat, loss of aquatic macroinvertebrates, turbidity, and sedimentation. Direct and indirect effects are discussed below. No interrelated or interdependent effects are anticipated.

Methodology for Effects Analysis

Useful quantitative data for the affected area and project action are limited; the assessment of project action effects therefore focuses mostly on qualitative identification. This approach was based on a review of ecological literature concerning the effects of loss and alteration of instream and riparian habitat, turbidity, and sedimentation on steelhead in particular and stream fish populations in general. This information was then compared to the estimated amount of instream, riparian, and aquatic macroinvertebrate losses, estimated background turbidity levels in the creek and associated with the project action, and estimated rates of sedimentation.

EFFECTS TO POPULATION

Migration

Project activities will include extensive dewatering and excavation during three consecutive years. Construction time windows have been incorporated to avoid winter and spring months when upstream migration of adults is most prevalent. No construction within the estuary will occur prior to June 1 of any year. Upstream of the estuary, work could begin as early as April 15, but only if Mission Creek does **not** have continuous surface flow (or less than ½ inch water depth at Caltrans cement channel) between Oak Park and the upper extent of the project area. If surface flow persists, construction will only occur after June 1. Under these conditions, no upstream or downstream migration of adults through the action area is expected, and outmigration of smolts through the action area should be minimal.

Stream diversions and dewatering are designed to allow for steelhead movement through the project area. At any given time only one half of the estuary will be dewatered to allow natural flow and tidal movement within the other half of the estuary. Upstream of the estuary, all flows will be directed through smooth pipe culverts, which allow downstream migration of smolts. Thus, except for the period of time (3-4 days) when the diversion is being constructed or relocated, any juveniles or smolts will be able to move freely through the project area.

Temporary delay in movement could occur for smolts when diversion culverts are being constructed. This artificial delay would only occur if continuous surface water were present. Because ACOE is required to begin construction only after June 1 if surface water is continuous, it is expected that the majority of outmigrating smolts should have moved down through the project area prior to start of project activities. Those individuals still migrating through, however, would be delayed for a period of up to 4 days while the culvert is being constructed. A biologist will be present during all diversion activities to relocate any fish, as necessary, that are delayed while the diversion culverts are put in place.

As described above, a number of possible impediments exist within Mission Creek, which steelhead must traverse to reach upstream spawning and rearing habitat. Under baseline conditions, steelhead must successfully pass through the channelized oxbow portion of the project area, through two Caltrans cement channels, and over numerous small vertical drops formed at bridge crossings. Because of these passage impediments, steelhead in Mission Creek are forced to use energy reserves above and beyond natural demands to reach good spawning habitat. Thus, any additional challenges placed on steelhead could severely delay or decrease successful migration, which in turn could lead to decreases in spawning output. To avoid additional impacts to steelhead migration, the ACOE will provide suitable conditions, including water depths and velocities, for fish passage through the project area both during and following project construction.

ACOE has completed hydraulic modeling for the project area to analyze existing and post-project streamflow conditions. Table 2 contains pre- and post-project water velocities at representative cross sections throughout the project area. Models incorporate a water conveyance of 640 cfs, which is the estimated mean annual flow or 2.3-year flow event. Based on channel size, this is the upper flow limit for upstream fish migration. By completing analyses at this level, the ACOE is characterizing the highest velocities that steelhead would encounter.

Table 2. Existing and post-project water velocities (ft/sec) modeled at specific cross sections within the project area.

	Water velocity (ft/sec) when conveying 640 cfs		
Cross section	**Existing channel**	**Proposed channel**	**Difference**
11	5	7	2
10	8	6	-2
9	5	3	-2
8	10	5	-5
7	6	4	-2
6	9	4	-5
4	2	4	2
		Average Change	**-2**

Based on this modeling, streamflow velocities will decrease by approximately 1 to 6 fps at five locations and increase by approximately 2 fps at two locations, with an overall net decrease in water velocity over the entire project reach. Resulting velocities range from 3.89 to 6.88 feet per second (fps).

Bell (1990) reports sustained swimming speeds (normal functions without fatigue) for average sized adult steelhead at 0-4.6 feet per second (fps), prolonged swimming speeds (lasting 15 seconds to 200 minutes which result in fatigue) at 4.6-13.7 fps, and burst speeds (activities which cause fatigue in 15 seconds or less) ranging from 13.7-26.5 fps. Data used in the Bell (1973) study are based on steelhead in the Pacific Northwest, which typically are larger, and thus stronger, than Southern California steelhead. Therefore, Southern California steelhead swimming abilities probably lie in the lower or middle range of the above estimates. All of the above water velocities fall within the lower range of estimated prolonged swimming speeds for steelhead. In addition, side baffles will be placed throughout the project area to provide resting areas for migrating steelhead (every 100-200 linear feet between Canon Perdido and Bath Street, every 400-500 ft between Bath and Gutierrez Streets, and every 100-200 feet downstream of Gutierrez). Provided these features occur within the lowflow or wetted channel, steelhead should be able to break the project area into several shorter stretches, rather than traversing the entire channel in one continuous effort. Considering the minor (1.5%) slope, projected velocities and location of rock baffles throughout the project area, NMFS anticipates that the

ACOE flood control channel will provide suitable conditions for upstream migration of adult steelhead.

Ledges, baffles and boulder clusters installed by ACOE will not be of any use to steelhead if they are not contained in the thalwag of the channel. It is possible that natural flow events will establish a lowflow channel that flows away from these structures. It is impossible to determine whether or not this will occur, but in conversations the ACOE has been made aware of this possibility, and has agreed to modify placement of side baffles and boulders, to the maximum extent possible, in order to maximize the benefits realized by steelhead.

As a result of construction activities, the channel invert will be artificially flattened and widened and will lack any natural heterogeneity that is currently present. Under such conditions, fewer resting areas are available, flows are spread out across the channel rather than being concentrated in a lowflow channel, and fewer hard structures are present to break up velocities. Thus, upstream migration of adults is made more difficult. If left alone, the channel will take at least 1 to 2 years to recover to somewhat natural conditions. Furthermore, it is likely that the benefits proposed by the ledges and side baffles will take time to develop since large flows are required to scour out pools under the ledges. ACOE will minimize these impacts by insuring that substrates, representative of natural conditions, are present in the channel following construction and by constructing a lowflow channel that, as close as possible, matches what would be established naturally. Although ACOE will attempt to minimize these temporary effects, some are unavoidable and will increase the amount of effort required of steelhead during upstream migration. NMFS does not, however, anticipate that these impacts will cause a decline in the steelhead population in Mission Creek.

Relocation

Incidental mortality could occur as a result of handling if fish relocations become necessary. All work areas will be surveyed for steelhead prior to any construction or maintenance activities. Any fish found in work areas will be relocated to suitable habitat within Mission Creek. Fish will be caught with nets only; electrofishing will not be utilized. Based on previous experience of NMFS personnel, incidental mortality is expected to occur for only a small percentage (<10%) of the fish that are relocated. Areas in upper Mission Creek, where juveniles would be relocated to, have better habitat (including cover, water quality and temperature) for juveniles to survive and grow through the dry season. Therefore, juveniles that survive relocations will likely have an increased chance of survival than if forced, even under natural conditions, to remain in poor habitat in lower Mission Creek. Given the conditions anticipated during project construction, these fish would certainly die if not relocated out of the construction area.

The number of fish that will need to be relocated, if any, is unknown at this time, but, as mentioned above, should be limited to rearing juveniles and outmigrating smolts. During most years, Mission Creek goes dry between Oak Park and the project area. Any rearing juveniles downstream of the cement channel are limited to the estuary and a limited number of scour pools for oversummering habitat. No records are available on the number of juveniles rearing in lower Mission Creek, but numbers are expected to be low, based on limited pool availability and poor habitat conditions. If we assume that 10 to 20 juveniles (which is likely an overestimate) will have to be relocated, and that 10% will die because of handling, then approximately 1 to 2 juveniles per year would be harmed or killed during relocations.

Observations of juveniles in the project area are isolated and sparse. Casual surveys by NMFS staff in upper Mission and Rattlesnake Creeks document high juvenile abundances (100s) during early summer months over at least 2-3 consecutive years. This information indicates that the upper Mission Creek watershed provides the vast majority, if not all, suitable spawning and rearing habitat for the system. The few juveniles seen rearing in the lower watershed (anecdotal observations) are most likely a small fraction of the juveniles present throughout the entire system.

Estimates of numbers of smolts migrating downstream through the project area also are not available. However, as described above, CDFG personnel observed approximately 100-200 fish (6-8 inches in length) in large pools at Oak Park during March 2000. A few weeks after the time of observation, 2 individuals of the same approximate size were observed in the estuary near the Mason Street Bridge. It is probable that the fish seen in the estuary were some of the same seen at Oak Park, on their way out to the Ocean. If a similar pattern of outmigration occurs during ACOE project activities, smolts may need relocating. Relocation will only be necessary, however, if they are present while diversions are constructed. Once diversions are in place, smolts will be able to move freely through the project area and will not need relocating. As discussed above, the majority of outmigration by smolts is expected to occur prior to the start of project construction. Continuous surface water persists into June only during years with relatively high rainfall. Even if these conditions occur, diversions will require only 1 to 4 days for construction. Because of the timing of diversion activities and limited time period for possible impacts, only a small number of smolts are expected to be present in the project area. NMFS anticipates that no more than 10 smolts, per year, will need relocation. Assuming 10% mortality due to handling, 1 individual smolt will be harmed or killed due to project construction activities.

ALTERATION OF INSTREAM HABITAT

Instream habitat is designated critical habitat within the Southern California ESU for the Federally endangered steelhead. Direct loss or alteration of instream habitat results when creek habitat is removed or modified during construction activities. The extent that steelhead are indirectly harmed by instream habitat alterations depends, in part, on the extent of permanent changes to substrate type, cover complexity, instream habitat complexity, water column depth and velocity patterns. Modifications that degrade the quality of instream habitat may cause reductions in fish abundance (Elser 1968; Hunt 1969; Dolloff 1986; Riley and Fausch 1995).

Project construction will impact, through excavation, grading and shaping approximately 5380 linear ft of instream habitat in Mission Creek (Table 3). Current instream habitat within the proposed project area consists of cement channel, and natural run habitat with a few isolated pools. Portions of this habitat will be unavailable to steelhead during construction. The ACOE flood control project will remove 420 linear ft of the existing cement channel and will leave any existing natural bottom in place. As discussed above, temporary impacts resulting from construction activities are unavoidable. Because of the extensive excavation and grading, the natural bottom will require time to recover and develop heterogeneous features. Under existing conditions, lower Mission Creek provides only limited habitat for oversummering juveniles. Suitable spawning habitat is not present. Because steelhead use the area primarily as a migration corridor, current use of this area will not be altered.

Table 3. Summary of linear feet altered by ACOE construction activities.

Feature	Existing Amount (ft)	Proposed Amount (ft)	Difference (ft)
Hard Channel Lining	1350	930	- 420
Hard Bank Protection	5210	6885	+ 1675

Maintenance of the flood control channel by the County will result in continued impacts to the channel invert of lower Mission Creek. Channel clearing and excavation will be completed any time capacity within a reach is lowered by at least 15%. The County will conduct maintenance activities in a mosaic pattern, as described above [See Project Description section], so that the same area is not impacted during consecutive years. Maintenance activities proposed by the County are the same as those that the County has been implementing for several years. ACOE completed a sediment deposition analysis for the project area, which can be used to determine if construction of the flood control channel will result in more frequent or more extensive maintenance than existing conditions require. Results of the analyses indicate that project construction will result in a net increase of 25 cubic yards of sediment after a 1-year storm event, and net decreases of 35 cubic yards and 385 cubic yards for 5-year and 20-year events, respectively. Thus, recurrent maintenance within the upstream channel and estuary should be less extensive than current practices until the occurrence of a large storm event (over 20 years).

Although the channel invert will be left to somewhat natural conditions, both embankments along the entire project reach will be lined with vertical cement walls of varying height (Table 3). Considering existing hard bank structures resulting from previous bank stabilization projects, the ACOE flood control channel will result in a loss of approximately 1675 linear feet of natural embankment. Vertical walls that would replace natural embankments do not allow for undercut banks or scour pools that provide important habitat and cover for steelhead. To compensate for the loss of natural embankment, ACOE has incorporated 1190 linear ft of overhanging ledges and 1940 linear ft of rock side baffles to promote formation of scour pools and provide shade and cover. Provided ledges and baffles provide the benefits to steelhead as currently proposed, these features should compensate somewhat for the loss of natural banks.

The additional benefits of natural bank, however, such as woody debris, leaf litter and insect drop, can not be simulated with manmade structures. These features provide important cover and food resources for rearing juveniles. The loss of this input in the project area will further preclude restoration of lower Mission Creek to include suitable rearing habitat. However, the current use of lower Mission Creek as a migration corridor will not be impacted.

Loss of Riparian Habitat

The riparian habitat affected by the project is part of designated critical habitat for the Southern California ESU for the Federally endangered steelhead. The functional values of riparian corridors and the benefits they provide to aquatic systems in general, and stream fish populations in particular, are well documented (Hall and Lantz 1969; Karr and Schlosser 1978; Lowrance et al. 1985; Wesche et al. 1987; Gregory et al. 1991; Platts 1991; Welsch 1991; Castelle et al. 1994; Lowrance et al. 1995; Wang et al. 1997).

Excavation activities will result in a loss of riparian vegetation along 7310 linear feet of embankment. Loss of riparian trees might increase the extent of solar radiation and fine sediment input to the creek, increase stream temperatures, reduce insect drop, and decrease the amount of woody debris input to streams. As much as is practicable, large sycamores will be avoided. As part of project activities, the ACOE has incorporated an extensive re-vegetation plan to mitigate for loss of existing trees and vegetation and to establish a healthy riparian corridor. The majority of vegetation that will be impacted consists of non-native vegetation, such as giant reed. These non-natives will be replaced with native vegetation and, ultimately, will improve the qualities of the riparian corridor. Riparian vegetation that provides shade, cover and insect drop for steelhead, however, will take a number of years to develop.

A shading analysis (Sierra Land Designer – 3D) was conducted to estimate the amount of Mission Creek that will be shaded following revegetation. The analysis concludes that upstream of Highway 101, Mission Creek will be completely shaded in 5 to 10 years. Fast growing willows and shrubs should provide some shading within the first 1 to 2 years. Under existing conditions downstream of Highway 101, the majority of shading is provided by buildings and houses, non-native giant reed, and some large sycamores. The sycamores will be left in place, as much as is practicable. Loss of giant reed will lessen shading in the short term, but replacement with sycamores and willows will eventually provide increased cover and shading within a few years. Phased construction over the course of 3 years insures that the entire reach will not be completely devoid of shading or vegetation at any given time. Although loss of natural cover and shading will occur temporarily following construction, shading and cover should begin to recover after 1 to 2 years.

Vegetation within the channel invert will be limited in size and nature during the County's routine maintenance activities. Vegetation greater than 4 inches in diameter will not be allowed to grow within the channel invert. These maintenance activities are currently conducted routinely throughout Santa Barbara County, including lower Mission Creek. Vegetation clearing is not expected to alter steelhead use of the project area, especially with shading and cover expected from the vegetated sideslopes and wall ledges.

SEDIMENTATION AND TURBIDITY

Turbidity refers to the amount of light that is scattered or absorbed by a fluid. Elevated levels of turbidity may result when fine sediment is contributed to the creek during project activities. High turbidity concentrations can cause fish mortality, reduce fish feeding efficiency, and decrease food availability (Berg and Northcote 1985; McLeay et al. 1987; Gregory and Northcote 1993; Velagic 1995). Turbidity may cause indirect harm, injury, or mortality to juvenile steelhead in the vicinity and downstream of the worksites due to decreases in respiratory function, feeding and/or growth (Waters 1995). Sedimentation occurs when fine sediments, such as those suspended during project activities, settle out of the water column and onto the creek substrate. Substantial sedimentation rates could bury less mobile organisms that serve as a food source for many fish species (Ellis 1936; Cordone and Kelley 1961), degrade instream habitat conditions (Cordone and Kelley 1961; Eaglin and Hubert 1993), cause reductions in fish abundance (Alexander and Hansen 1986; Berkman and Rabeni 1987), and reduce growth in salmonids (Crouse et al. 1991).

Channel excavation and grading could result in an increase of fine sediments within the creek channel. This would cause increased turbidity and sedimentation if these sediments are suspended and washed downstream during the following winter storm events. Because embankments will be armored with vertical cement walls, sediment input will be limited to the channel invert and erosion of topsoil placed on top of riprap sideslopes. In order to minimize inputs of sediments into Mission Creek, ACOE will use pipe culverts to divert streamflow around project areas during excavation, grading and revegetation. In addition, any bare soil along the sideslopes will be covered with landscaping mat until vegetation has established enough to stabilize the soil.

As water levels drop during summer months, exposure to sun and wind causes sediment to loosen and dry. Thus, high turbidity and sedimentation occurs naturally during early winter storm events when unconsolidated sediments are suspended and washed downstream. Unconsolidated sediments resulting from project activities are expected to be washed downstream during the first rain event of each year when background levels are high. Although these background levels will be increased due to project activities, the increase will be limited to sections within the lower 1.2 miles of the creek and are expected to be temporary. Steelhead could be temporarily delayed if turbidity levels are too high to allow migration. NMFS expects, however, that the degree of increase will not increase significantly over background levels to delay migration.

VI. Cumulative Effects

Cumulative effects include the effects of future state, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. The NMFS is generally familiar with actions affecting steelhead in Mission Creek and is unaware of such actions that would be reasonably certain to occur within the action area. Future Federal actions that are unrelated to the project action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. Consequently, NMFS believes no cumulative effects are likely.

VI. Summary

Steelhead occurring within the project area during construction will be limited mainly to rearing juveniles and outmigrating smolts. Minor amounts of harassment and incidental mortality could occur (10-20 fish captured and 1-2 individuals experience mortality during relocations) during stream diversion and relocations. This small number of individuals affected is not expected to affect the survival of the steelhead population in Mission Creek or the survival and recovery of the Southern California ESU.

NMFS expects 5380 linear ft of temporary and permanent impacts to designated critical habitat, along the channel invert and both embankments, resulting from the project action. Within this area, project construction will result in the permanent loss of natural banks, and temporary degradation to the stream bed and riparian vegetation. In addition, maintenance activities will result in ongoing impacts to the stream bed. These impacts, however, will not alter the current use of lower Mission Creek as a steelhead migration corridor. Furthermore, with the maintenance of a natural bottom channel bed, incorporation of fish baffles and ledges, and enhancement of the riparian corridor, including replacement of non-native with native vegetation, these impacts are not expected to diminish the value of habitat for the survival and recovery of the Mission Creek population or of the Southern California ESU.

VII. Conclusion

After reviewing the best scientific and commercial data available and the current status of steelhead, the environmental baseline for the action area, the effects of the ACOE flood control channel, and the cumulative effects, it is the opinion of NMFS that the ACOE project action is not likely to jeopardize the continued existence of the Federally endangered Southern California steelhead ESU and is not likely to destroy or adversely modify designated critical habitat.

INCIDENTAL TAKE STATEMENT

Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. Harm is further defined to include significant habitat modification or degradation which actually kills or injures fish or wildlife by significantly impairing essential behavior patterns, including breeding, spawning, rearing, migrating, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and 7(o)(2), taking that is incidental to and not intended as part of the proposed action is not considered to be prohibited taking under the Act provided that such taking is in compliance with an Incidental Take Statement.

The measures described below are nondiscretionary, and must be undertaken by the ACOE so that they become binding conditions of any grant or permit issued to the County, as appropriate, for the exemption in section 7(o)(2) to apply. The ACOE has a continuing duty to regulate the activity covered by this incidental take statement. If the ACOE (1) fails to assume and implement the terms and conditions or (2) fails to require the County to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the County must report the progress of the action and its impact on the species to NMFS as specified in the incidental take statement (50 CFR 402.14(i)(3)).

I. EXTENT OF TAKE

The NMFS believes the proposed ACOE flood control project on Mission Creek, Santa Barbara County, California, may result in the incidental take of steelhead. Any incidental take resulting from the ACOE flood control project will mostly likely be limited to outmigrating smolts or rearing juveniles located within the project area. Incidental take in the form of harassment, harm, or mortality could occur if fish are unable to migrate through the project area. In addition, incidental take could occur in the form of "harassment, collection capturing and/or mortality" if it becomes necessary to relocate individuals out of the project area. It is anticipated that relocation will occur on an annual basis during project construction (3 yrs). NMFS expects that mortality of fish due to handling during relocation will probably be less than 10 percent of captured fish.

Juveniles have been observed in scour pools within the project area. If juveniles are found prior to construction or maintenance activities, ACOE or the County shall relocate them. Conservatively, NMFS expects that less than 10 juveniles will be located in the project area each year at the time of project construction activities. Thus, NMFS does not anticipate mortality of rearing juveniles beyond one individual per year.

As discussed above, the majority of outmigration by smolts is expected to occur prior to the start of project construction. Continuous surface water persists into June only during years with relatively high rainfall. Even if these conditions occur, diversions will require only 1 to 4 days for construction. Because of the timing of diversion activities and limited time period for possible impacts, only a small number of smolts are expected to be present in the project area. NMFS anticipates that no more than 10 smolts per year, will need relocation. Assuming 10% mortality due to handling, 1 individual smolt will be harmed or killed per year of construction activities due to relocations. No harm or mortality should occur to smolts as a result of maintenance activities.

The accompanying biological opinion does not anticipate any form of take that is not incidental to the proposed project action. This Take Statement anticipates no mortality beyond one juvenile and one smolt during any year. If recurrent mortality occurs, or if mortality beyond 10 percent of steelhead being relocated (not to exceed 1 juvenile and 1 smolt per year), the ACOE shall reinitiate consultation.

II. Effect of Take

In the accompanying biological opinion, NMFS concluded that the anticipated level of take associated with the project action is not likely to jeopardize the continued existence of the Federally endangered Southern California steelhead ESU.

III. Reasonable and Prudent Measures

NMFS believes the following reasonable and prudent measures are necessary and appropriate to minimize and monitor incidental take of steelhead:

1. The ACOE shall avoid and minimize impacts to steelhead from construction and maintenance activities.

2. The ACOE and County shall minimize the extent of permanent changes to instream and riparian habitat.

3. The ACOE and County shall minimize cumulative impacts and/or delays to fish migration in Mission Creek.

4. The ACOE and County shall monitor the project area to ensure correct project implementation and to minimize the take of steelhead incidental to project operations.

IV. Terms and Conditions

In order to be exempt from the take prohibitions of the ESA, the ACOE must comply and/or ensure that the County complies with the following terms and conditions, which implement the reasonable and prudent measures described above and outline reporting/monitoring requirements. These terms and conditions are non-discretionary:

1. The following terms and conditions implement reasonable and prudent measure No. 1.

A. ACOE shall complete any construction activities occurring downstream of Yanonali Street between June 1 and November 30 of any year.

B. ACOE shall complete any construction activities occurring upstream of Yanonali Street between June 1 and November 30 of any year if continuous surface flow (or more than ½ inch water depth in Caltrans channel immediately upstream of project area) is present between Oak Park and the project area. If continuous surface flow is **not** present between Oak Park and the project area, activities may occur between April 15 and December 1 of any given year.

C. The County shall complete all maintenance activities between August 1 and October 31 of any given year.

D. Downstream of Yanonali Street, ACOE shall isolate and dewater only one side of the channel at a time to allow normal tidal flushing and unimpeded stream flows within the other half. Any water remaining within the work site shall be pumped through a filter to capture any silt and then into the wetted area surrounding the enclosure.

E. Upstream of Yanonali Street, ACOE shall divert all stream flow through pipe culverts. Culverts shall be smooth along the inside lining and at any culvert joints. Combined capacity of the culverts shall be at least 40 cfs. Any water remaining within the work site shall be pumped through a filter to capture any silt and then into the diversion channel.

F. A fishery biologist with expertise in the areas of fish biology and ecology, fish/habitat relationships, biological monitoring, and handling, collecting, and relocating salmonid species shall be responsible for all required monitoring of the project area. The biologist will survey the project area by snorkeling or visual observations from the embankments prior to any project activities, including all diversion, construction and maintenance activities. No diversion, construction or maintenance activities shall occur while steelhead are present.

G. The biologist shall capture any steelhead located in project areas and relocate the individuals to suitable instream habitat in Mission Creek. All relocations shall be coordinated with NMFS and CDFG and shall be conducted as described in the attached Biological Opinion.

H. The biologist shall monitor construction activities, instream habitat, and performance of sediment control/detention devices for the purpose of identifying and reconciling any condition that could adversely affect steelhead or their habitat. The biologist shall be empowered to halt work activity and to recommend measures for avoiding adverse effects to steelhead and their habitat.

I. The ACOE biologist shall contact NMFS (Anthony Spina, 562-980-4045) immediately if one or more steelhead are found dead or injured. The purpose of the contact shall be to review the activities resulting in take and to determine if additional protective measures are required. Subsequent notification must also be made in writing to NMFS (501 W. Ocean Blvd., Suite 4200, Long Beach, California 90802) within five days of noting dead or injured steelhead. The written notification shall include the date, time, and location of the carcass or injured specimen, a color photograph, cause of injury or death, and name and affiliation of the person who found the specimen.

J. When practical, ACOE and the County shall use existing points of ingress or egress, or perform work from the top of the creek banks, for the purposes of avoiding work and heavy equipment in flowing water, and disturbing creek bank vegetation, and instream habitat.

K. Erosion control and sediment detention devices shall be incorporated into the ACOE project and implemented at the time of the project action. These devices shall be in place during construction, maintenance, and after if necessary, for the purpose of minimizing sediment and sediment/water slurry input to flowing water. The devices shall be placed at all worksites where likelihood of sediment input exists. The devices shall be maintained at least once daily. Sediment collected in the devices shall be disposed of off site.

L. Refueling of heavy equipment and vehicles will occur only within a designated area where potential spills can be readily contained. Equipment shall be checked and maintained to prevent leaks of fuels, lubricants or other fluids into the stream.

2. The following terms and conditions implement reasonable and prudent measure No. 2.

A. The ACOE shall photograph the project site before, during and immediately after the project is completed and develop a reference of instream and riparian habitat characteristics.

B. The ACOE shall insure substrate, representative of natural conditions, are present in the channel following construction activities. The basis for natural conditions shall be based on planned geotechnical surveys and pebble counts completed at locations within the project area that are most representative of natural conditions (e.g., between Ortega and De la Guerra Streets, between Bath and Cota Streets, upper end of oxbow below Gutierrez).

C. The County shall insure that representative types and sizes of substrate, such as small rocks or boulders, are present in the channel following maintenance activities.

D. Following construction activities, ACOE shall construct a lowflow channel that extends the length of the project area and that reflects what would be formed through natural processes.

E. Following maintenance activities, the County shall construct a lowflow channel that extends the length of the project area and that reflects what would be formed through natural processes.

F. The ACOE shall minimize disturbance to riparian and upland vegetation. All native vegetation removed for project activities will be disposed of off site or utilized during post construction revegetation. The ACOE shall implement a full re-vegetation plan including planting of at least 120 trees on channel sideslopes, at least 330 trees in habitat expansion area and hydroseeding with native grasses and shrubs.

G. The ACOE shall monitor growth and survival at the revegetated sites for 5 years following completion of project construction for the purpose of assessing the growth of the plantings or seedlings. The County shall photograph each site during each inspection.

3. The following terms and conditions implement reasonable and prudent measure 3.

A. ACOE shall develop a Streamflow Monitoring Plan, to be approved by NMFS, with the purpose of documenting flow conditions within the completed flood control channel. The plan shall include monitoring of stream flows, benchmark water velocities and depths, interactions between rock baffles and the lowflow channel, and any opportunistic observations of steelhead migration. The monitoring plan shall be completed, and approved by NMFS prior to the start of any project activities.

B. Based on methods outlined in the monitoring plan, all monitoring data shall be collected and compiled as soon as is practicable, based on streamflows, within a time period not to exceed five years following construction of the flood control channel.

C. If the information collected during monitoring indicates that the flood control channel is not providing suitable conditions for upstream steelhead migration, the ACOE shall modify the channel, as necessary, to provide passage.

D. ACOE shall complete hydraulic analyses to characterize existing flow conditions within the Caltrans channel located immediately upstream of the project area.

4. The following terms and conditions implement reasonable and prudent measure 4.

A. The ACOE shall provide a written monitoring report to the NMFS within 15 working days following each fish relocation effort. The report shall include: the number and size of steelhead relocated from the project site, a specific description of locations where fish are relocated to, the number and size of steelhead relocated to each location, a description of any problem encountered during relocation, the number and size of any steelhead killed or injured during relocation, and any effect of the project action on steelhead that was not previously considered.

B. The ACOE shall provide a written monitoring report to the NMFS within 20 working days following completion of the project action of each work year. The report shall include the number of steelhead removed from the project site and killed or injured during the project action and biological monitoring; a description of any problem encountered during the project or when implementing terms and conditions; the number and size of steelhead noted and relocated; any effect of the project action on steelhead that was not previously considered; and pre- and post-project photographs documenting compliance with Reasonable and Prudent Measures No. 1 and 2.

C. The ACOE shall provide a written report describing results of the revegetation measures to the NMFS within 20 working days following completion of revegetation. The report shall include a description of the sites planted or seeded, the area (ft^2) revegetated at each site, a plant palette for each site, planting or seeding methods, and pre- and post-planting color photographs of each site.

D. The ACOE shall provide a written report describing the results of the revegetation measures as observed during annual site inspections to NMFS by August 15 of each monitoring year. The report shall include the color photographs taken of each site during each inspection, the color photographs taken before and after implementation of the project, survival and growth of plantings or seedlings, and observations noted by the biologist.

E. The ACOE shall provide a written report describing the results of the Streamflow Monitoring to NMFS by August 15 of each monitoring year. The report shall include interpretation and data for stream flows, water velocities, water depths, and baffle observations.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

NMFS recommends the following conservation recommendations to be carried out by the ACOE and/or the County for the Lower Mission Creek Flood Control Channel:

1. Despite the additional flood control protection provided by the ACOE project, NMFS encourages the City, County and ACOE to strive towards restoring Mission Creek to more natural habitat in the future. In order to provide natural habitat, which would also provide the needed flood control protection, both the creek channel and surrounding flood plain would need to be increased, and banks would need to be sloped back. Therefore, the City, County and ACOE need to limit further development within the floodplain and pursue acquisition of existing properties along the creek.

2. Implementation of measures to provide improved fish passage through the cement channel located directly upstream from the project location.

3. Implementation of measures to provide improved fish passage through Mission and Rattlesnake Debris Basins.

4. Implementation of measures to provide improved fish passage through the Botanical Gardens.

In order for NMFS to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the NMFS requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the action outlined in the ACOE's request for consultation dated June 20, 2000. As provided in 50 CFR § 402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded, (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion, (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, formal consultation shall be reinitiated immediately. During reinitiation, NMFS, ACOE and the County shall review and modify construction and/or maintenance techniques, reassess the techniques used for fish relocations, modify the placement of side baffles and ledges to provide the projected benefits for steelhead, and assess need for implementation of recommended conservation measures.

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
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June 1, 2001

Robert E. Koplin
Los Angeles District, Corps of Engineers
Department of the Army
P.O. Box 532711
Los Angeles, California 90053-2325

Subject: Biological Opinion for the Lower Mission Creek Flood Control Project, Santa Barbara County, California (1-8-00-F-74)

Dear Mr. Koplin:

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion on the U.S. Army Corps of Engineers' (Corps) Lower Mission Creek Flood Control Project (Project) located in the city of Santa Barbara, Santa Barbara County, California, and its effects on the endangered tidewater goby (*Eucyclogobius newberryi*). This biological opinion has been prepared in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). We received your June 21, 2000 request for formal consultation on June 22, 2000.

This biological opinion is based on the information provided in your June 21, 2000, request for consultation, your biological assessment pertaining to the tidewater goby, previous documents submitted by the Corps in support of the consultation, communications with experts on the species, communications between staff of the Corps and the Service, and our files. A complete administrative record for this biological opinion is on file at the Ventura Fish and Wildlife Office.

CONSULTATION HISTORY

We have been involved with the Corps on the proposed Project since June, 1999, as part of a Fish and Wildlife Coordination Act agreement (Service 1999). We commented on the proposed Project in a draft Fish and Wildlife Coordination Act Report, which was sent to the Corps in December of 1999. The Corps submitted a biological assessment in December, 1999, along with a draft environmental impact statement/environmental impact report. Subsequent to this submission, the proposed Project was modified and a revised biological assessment was submitted, along with the June 21, 2000, request for consultation. On May 3, 2000, we sent the final Fish and Wildlife Coordination Act Report to the Corps. Additionally, in March, 2000, the

U.S. Department of the Interior Office of Environmental Policy and Compliance sent comments on the proposed Project to the Corps.

The Corps initiated formal consultation in a letter dated June 21, 2000, and we issued a biological opinion to the Corps on February 16, 2001. During its review of the document, the Corps realized that the ongoing maintenance was not addressed because of direction received by the Service stating that the Santa Barbara County Flood Control District (County) would be responsible for this activity. In a discussion on February 22, 2001, the Corps informed the Service that maintenance was in fact part of the proposed project. In response to the new information and other concerns, the Corps requested that the Service prepare a draft biological opinion that would include an analysis of the construction phase of the project as contained in the original February 16, 2001, version, and an analysis of the effects of the continued maintenance of the project.

Following its review of the draft biological opinion, which we provided on March 20, 2001, the Corps presented additional concerns. In particular, the Corps had stated during preparation of the draft biological opinion, that the Service need not consider long-term, future maintenance as a covered activity in this consultation. Consequently, we did not include a discussion of maintenance in the draft biological opinion. In a meeting on April 18, 2001, the Corps requested that the long-term mantenance be added to the final biological opinion. Additionally, the Corps informed the Service that the Corps does not issue itself a permit for civil works projects; however, the County, in its responsibility for long-term maintenance, has applied for a section 404 general permit for continued activities. The duration of the section 404 permit would be determined by the Corps' regulatory branch. This new information is included in this biological opinion.

The Corps and the National Marine Fisheries Service have completed formal consultation for the federally endangered steelhead trout (*Onchorynchus mykiss*) which also occurs in Mission Creek.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The purpose of the proposed Project is to increase the flood carrying capacity in Mission Creek to 3,400 cubic feet per second (cfs). The proposed Project would cover approximately a mile of Mission Creek between Cañon Perdido Street Bridge at the upstream end and Cabrillo Boulevard Bridge at the downstream end (figure 4 from Corps 2000, enclosed). Presently, this section conveys approximately 1,050 cfs and is prone to frequent flooding. The changes to lower Mission Creek would include the widening of the creek, replacement of bridges, streamlining bedslope, stabilizing and protecting creek banks using vertical walls and vegetated riprap sideslopes, and installing an overflow culvert that bypasses the oxbow between Highway 101 and the Chapala Street Bridge. The widened creek would generally follow the existing alignment. Sections with natural creek bottom would be maintained and, in some sections, existing concrete bottom would be restored to a natural bottom. According to the biological assessment (Corps 2000), the project would alter the net sediment budget by capturing more fine materials upstream.

The Project components that could affect the tidewater goby include excavation, construction, and maintenance.

Excavation and Construction

The Corps anticipates that the excavation and construction could be completed in approximately two years. Inclement weather, funding constraints, mechanical failure, or other unexpected events may extend this time frame. Specific excavation and construction activities that could affect tidewater gobies are as follows:

1. Bank Removal and Excavation - All existing banks would be removed in the project area with the exception of a retaining wall located just upstream of the De la Guerra Street Bridge and along the oxbow between Highway 101 and the Chapala Street Bridge. The creek bottom would also be excavated in the proposed Project area to widen the channel. The total amount of material to be excavated from both the creek bottom and the banks is estimated at 246,000 cubic feet. Excavated material would be partially stockpiled in a staging area located along the creek bank and the remaining material, approximately 192,000 cubic feet, would be recycled or transported to disposal sites located within a radius of 10 to 20 miles from the proposed Project site. The Corps estimates that 51,000 to 54,000 cubic feet of material would be used in Project construction as fill material. Usable earthen material may be reused as backfill or cover for the riprap slope. The Corps estimates that channel excavation will likely require 130 to 180 days to complete.

2. Bank Protection - Existing bank protection would be replaced with either a vertical wall (toe wall) or a combination of vertical wall and vegetated riprap sideslope. The upper half of the vegetated riprap sideslope would be sloped back with concrete pipes in varying sizes placed to allow the planting of native trees and vegetation. Wherever this combination of toe wall and vegetated riprap sideslope is used, the vertical height of the toe wall would be half the depth of the creek. For example, if the depth of the creek is 8 feet, the toe wall would be 4 feet tall, with the remainder being vegetated riprap. Below Highway 101, this combination toe and vegetated riprap would be used along the southeast bank, starting from the midpoint between Chapala and Mason Street Bridges down to the midpoint between the Mason and State Street Bridges. Vertical walls would be applied or maintained for the remainder of the downstream Project area. Above Highway 101, the combination toe wall and vegetated riprap would be the primary bank protection modification, with the exception of two short reaches just upstream of the Haley-De la Vina Bridge and the De la Guerra Bridge.

3. Replacement of Existing Bridges - Four bridges in the proposed Project area would be removed and replaced. Those are Ortega Street, Cota Street, De la Vina Street, and

Mason Street. Minor modifications of other bridges may be required to increase conveyance capacity.

4. Weir Inlet and Overflow Culvert - A reach of lower Mission Creek known as the "oxbow" runs between the Guiterrez and Chapala Street Bridges. The Corps proposes to build a weir inlet and overflow culvert beginning immediately downstream of the Guiterrez Street Bridge. The weir inlet would be constructed to allow flows only during storm events (greater than 640 cfs). From the weir inlet, storm flows would flow into an overflow culvert. The culvert would essentially connect both ends of the oxbow. The California Department of Transportation has built a culvert span across Highway 101 so traffic is not affected during storm events. The culvert would also cross beneath Montecito Street and the railroad tracks before rejoining the creek downstream of the Chapala Street Bridge. Downstream of the Montecito Street Bridge, the culvert would be buried (figure 4 from Corps 2000).

5. Rock Energy Dissipaters and Boulder Clusters - Three reaches of lower Mission Creek would be modified using a dissipater design consisting of the placement of large boulders and riprap. The first location would be from Cañon Perdido Street to below the De la Guerra Street Bridge. The second location would be from upstream of the Gutierrez Street Bridge downstream to the upper bend of the natural oxbow, near Highway 101. The third reach would be at the outlet of the overflow culvert. This design would basically include the placement of riprap into the widened creek channel, along with the embedding of large boulders three to four feet in diameter arranged in clusters in the riprap. This design is intended to dissipate the force of currents at vulnerable places along the creek and improve habitat for the steelhead trout.

6. Expanded Habitat Zones - The proposed Project may have as many as five small parcels of land that would be used for planting native riparian vegetation and as small recreational park space. The parcels of land in consideration range from 0.03 to 0.52 acre. Final calculations for the proposed Project channel configuration would determine how much of this space is available for planting. Native riparian trees obtained from local nursery stock would be planted in the habitat expansion zones. In some of these zones, pathways and benches may also be added.

Another habitat expansion zone may be created near the oxbow formation area. However, because the area has been contaminated from past use by a dry cleaning business, it would have to be remediated prior to the construction of a habitat expansion zone. The area is approximately 0.6 acre in size. Finally, the vertical toe and vegetated riprap design is also considered as habitat expansion by the Corps, as vegetated riprap is currently lacking in most stretches of lower Mission Creek.

7. Structural Features to Minimize and Avoid Impacts to Biological Resources - To minimize the effects of the action on the tidewater goby and the steelhead, the Corps has

incorporated several structural features as part of the channel widening. The Corps has designed "hiding" places where fish can take refuge. These hiding places include coarse surface relief built into the lower sections of vertical walls as tidewater goby refugia, concrete overhangs projecting out from the vertical wall (fish ledges), and placement of double rows of coarse boulders between the overhangs along the vertical walls (fish baffles). A combination of these three features would be placed within the Mission Creek estuary between Mason Street and Cabrillo Boulevard on both sides. The ledges and baffles design would be used throughout the remainder of the proposed Project reach. More baffles than ledges would be placed.

Maintenance of the Project Area

The biological assessment describes maintenance in two areas:

1. Upstream Sediment and Vegetation Management - Sediment and vegetation will be removed periodically from the Mission Creek channel above the Yanonali Street sill. None of this perpetual maintenance would take place within the estuary. The County would conduct maintenance in the same manner that it has for many years. The upstream maintenance activities would not change under the project, with the exception of those measures included in the Corps' maintenance manual; *i.e.*, sediment and vegetation would only be removed between August and October, when the creek is generally dry and, if any flow is present, silt fences would be installed during removal of sediment and vegetation. The Corps' maintenance manual for the Mission Creek project will incorporate all measures specified in the environmental impact statement prepared for the project, the 404 permit to be issued to the County for long-term maintenance, and the terms and conditions of this biological opinion.

   The upstream maintenance would not be performed every year unless conditions warrant. The sediment removal would only occur when the capacity of the flood control channel has been reduced by 15 percent.

2. Downstream Vegetation Management - The Corps would be responsible for maintenance of vegetation, including that in the Expanded Habitat Zones described above and the plantings to be performed as beneficial measures, described below. All of this maintenance would occur downstream of the Yanonali Street sill. The proposed monitoring of vegetation includes documentation of vegetation growth. If the plants do not meet pre-determined growth and survival rates [as specified in the biological assessment (Corps 2000) and incorporated herein by reference], the Corps would implement actions to improve growing conditions, such as fertilizer, increased irrigation, and replanting. Periodic augmentation of soil in the vegetated riprap may be accomplished by using sediment removed from clearing activities or importing soil from other areas.

For the first year after completion of construction and planting, monitoring would occur every three months, the second year every four months, and the third, fourth, and fifth year every six months. The Corps would do the maintenance for the first five years following construction. Thereafter, the Corps has assumed that the vegetation will not require maintenance but will be self-sustaining. Although some mortality is expected over the long-term, only in the event of bank failure and necessary reconstruction would vegetation be replaced by the County.

In addition to the activities described above, the project would include measures that would be implemented to avoid and minimize some adverse effects to tidewater gobies. The proposed minimization measures include the following:

1. Native Vegetation Planting - The Corps would plant native vegetation below the Yanonali Street bridge in the areas that have been excavated or recontoured, and where such plantings would be appropriate. Planted vegetation would consist of native trees, shrubs, and grasses. A Project biologist would coordinate the planting of vegetation. A temporary above-ground irrigation system would be installed to irrigate planted vegetation. The irrigation system would be used for a maximum of three years. Irrigation water would come from municipal sources and the Corps would ensure that planted vegetation is watered sufficiently. The Corps estimates that riparian vegetation would reestablish to its current height and thickness within 3 to 5 years and that the structural complexity and diversity equal to typical coastal stream habitat would be attained within 30 years.

   Giant reed (*Arundo donax*) and other non-native vegetation would be first removed by hand, then treated with an application of glyphosate herbicide via cutting of stems to the ground and painting of exposed surfaces, as needed. Large western sycamores (*Platanus racemosa*) would be retained where feasible.

2. Creek Dewatering Practices - Impacts to the tidewater goby would result from the necessity to dry the streambed and toe of banks prior to construction between Cabrillo Boulevard and Yanonali Street. To minimize the impact caused by drying the streambed, the Corps proposes to time the construction activity outside of the tidewater goby spawning period, conduct dewatering and construction in only half of the streambed at a time, and relocate tidewater gobies that remain in the construction area.

   The dewatering of half the streambed would be accomplished by dividing the creek and estuary length-wise using an impermeable barrier, such as sheet piling. At the upstream end of this barrier, half the estuary would be dammed to allow water to continue to flow through the other half of the creek/estuary. Once this is done, qualified biologists would walk downstream in a zig-zag pattern to herd as many tidewater gobies as possible downstream. When the tidewater gobies have been herded downstream, an exclusion dam would immediately be lowered to seal off their re-entry into the work area. The biologists would once again enter the confined area and seine the streambed to capture any remaining tidewater gobies. If tidewater gobies are captured, they would be relocated to the wet side of the estuary. When this process has been completed, the confined area would be pumped of any remaining water with an intake hose covered with a half-inch mesh screen. Biologists would monitor the drying of the confined area and seine it thoroughly at least twice a week if necessary. This process would be repeated for the other side of the creek once the project on one side is completed.

Mechanized equipment would enter the creek via existing parking lots at Cañon Perdido and Cota Streets or the area immediately adjacent to the oxbow. To minimize contamination of the creek by heavy equipment, the Corps proposes to inspect equipment for leaks and drips on a daily basis prior to the commencement of work. A storm water pollution prevention plan would also be prepared to minimize the potential discharge of oil or grease into the creek. Best management practices (BMPs) would be followed during construction and excavation. No work, outside of the placement of impermeable barriers, dams, and culverts, would be allowed in flowing water except as absolutely necessary.

Upstream of Yanonali Street, where tidewater gobies are not found, the streambed would be dewatered using a system of in-channel culverts and the Corps would place a series of silt curtains immediately below the construction area in an effort to reduce suspended sediments in the creek. The culverts would be at least 24 inches wide and no longer than 300 feet.

Prior to construction, the construction crews would be briefed on the environmental commitments. The Corps, or a Corps contractor, would monitor the construction contract bi-weekly during the initial stages of construction to ensure compliance with various conditions. Finally, during construction of the proposed Project, the Corps, or a Corps contractor, would monitor turbidity levels within the creek water.

3. Beneficial Effects - The Corps believes this Project would benefit the tidewater goby by doubling the size of the estuary as a result of removing bank stabilization structures and widening the channel, and by reducing siltation into the estuary. Additionally, the Corps believes the toe wall design features in the estuary would provide refugia for tidewater gobies.

STATUS OF THE SPECIES

The tidewater goby was listed as endangered on March 7, 1994 (59 Federal Register 5494). A recovery plan has not been published. On June 24, 1999, the Service proposed to delist the remaining northern populations of the tidewater goby because we concluded the listing exaggerated the risk of extinction by overestimating the rate of local population extinction and the northern populations of the tidewater goby are not presently in danger of extinction or likely to become in danger of extinction within the foreseeable future (64 Federal Register 33816). In the proposal to delist the northern populations, the Service defined a southern distinct population segment (DPS) as those populations occurring in San Diego and Orange counties. Critical habitat was designated for this DPS on November 20, 2000 (65 Federal Register 224). A final determination on delisting the northern populations has not been made at this time. Detailed information on the biology of the tidewater goby can be found in Wang (1982), Irwin and Soltz (1984), Swift *et al.* (1989), Worcester (1992), and Swenson (1995); much of the information from this account was taken from these sources.

The tidewater goby is a small, elongate, grey-brown fish not exceeding two inches standard length. The species, which is endemic to California, is typically found in coastal lagoons, estuaries, and marshes with relatively low salinities (approximately ten parts per thousand (ppt)). Its habitat is characterized by brackish shallow lagoons and lower stream reaches where the water is fairly still but not stagnant. However, tidewater gobies can withstand a range of habitat conditions; they have been documented in waters with salinity levels from 0 to 42 ppt, temperatures from 46 to 77 degrees Fahrenheit, depths from 10 inches to 6 feet or more, and dissolved oxygen levels of less than one milligram per liter.

Tidewater gobies may, at times, range upstream into fresh water, up to one and a half miles from an estuary. In San Antonio Creek and the Santa Ynez River, Santa Barbara County, tidewater gobies are often collected four to five miles upstream of the tidal or lagoonal areas, sometimes in beaver-impounded sections of streams. Conversely, tidewater gobies enter marine environments if sandbars are breached during storm events. The species' tolerance of high salinities (up to 60 ppt for short periods) likely enables it to withstand the marine environment and to colonize or re-establish in lagoons and estuaries following flood events, as has been recently hypothesized (Lafferty *et al.* 1999a, b).

The tidewater goby is primarily an annual species in central and southern California, although some variation has been observed. If reproductive output during a single season fails, few if any tidewater gobies survive into the next year. For this reason, populations can be sensitive to short-term adverse environmental conditions. In one notable case, a population estimated at between 10,000 and 30,000 individuals was extirpated after a single construction project (Swift and Holland 1998). However, recent research suggests that tidewater gobies have adapted to climatically dynamic conditions and are adept at recolonizing sites from which they have been extirpated (Lafferty *et al.* 1999a).

Reproduction peaks from late April or May to July and can continue into November or December depending on the seasonal temperature and rainfall. Males begin the breeding ritual by digging burrows (four to five inches deep) in clean coarse sand and silt. Females then deposit eggs into the burrows, laying an average of 400 eggs per spawning effort (Swenson 1999). Males remain in the burrows to guard the eggs. Males frequently forgo feeding during this period, possibly contributing to the mid-summer mortality noted in some populations. Within nine to ten days, larvae emerge. The larvae live in vegetated areas within the lagoon until they are 0.75 inch SL, when they become substrate oriented, spending the majority of time on the bottom rather than in the water column. Both males and females can breed more than once in a season, with a lifetime reproductive potential of 3 to 12 spawning events.

Tidewater gobies feed on small invertebrates, usually mysids, amphipods, ostracods, snails, and aquatic insect larvae, particularly dipterans, most of which live in the sediments. Small tidewater gobies probably feed on unicellular phytoplankton or zooplankton similar to many other early stage larval fishes (Swenson and McCray 1996).

Historically, the tidewater goby occurred in at least 110 California coastal lagoons from Tillas Slough near the Oregon border to Agua Hedionda Lagoon in northern San Diego County. The southern extent of its distribution has been reduced by approximately eight miles. The species is currently known to occur in about 85 locations, although this number will decrease during severe drought conditions. Today, the most stable populations are in lagoons and estuaries of intermediate sizes (5 to 124 acres) that have remained relatively unaffected by human activities. These populations have probably provided colonists for nearby smaller ephemeral sites (Swift *et al.* 1997, Lafferty *et al.* 1999b).

Losses of tidewater goby populations can be attributed primarily to urban, agricultural and industrial development in and surrounding coastal wetlands and alteration of habitats from seasonally closed lagoons to tidal bays and harbors. Some extirpations are believed to be related to pollution, upstream water diversions, and the introduction of exotic fish species (most notably sunfishes and black basses [Centrarchidae]). These threats continue to affect some of the remaining populations of tidewater gobies. Tidewater gobies have been extirpated from several water bodies that are impaired by degraded water quality (*e.g.*, Mugu Lagoon, Ventura County), but still occur in others (*e.g.*, Santa Clara River, Ventura County).

ENVIRONMENTAL BASELINE

The estuary of Mission Creek is a relatively small California coastal estuary. It extends from the small lagoon formed at its mouth to the sill at Yanonali Street. The size of the lagoon expands and contracts with given amounts of rainfall and whether it has breached to the ocean, but typically rarely exceeds five acres. The lower portions of Mission Creek lie within urbanized Santa Barbara. The Mission Creek drainage originates from the Santa Ynez Mountains in the Los Padres National Forest. The drainage, including its tributaries, is approximately 11.5 square miles in size (Service 2000a). The lower reaches of Mission Creek are typically dry in the summer months, although urban runoff keeps small amounts of water moving through the creek. During the summer months, the City of Santa Barbara traditionally manually breached the Mission Creek lagoon due to health and safety concerns; however, upon being notified in 2000 that this activity was not permitted, the City ceased the breaching. During high rainfall years, lower Mission Creek is prone to overtopping its banks and high flow velocities.

Over several decades, crude bank protection has been attempted through the placement of grouted stone, sacked concrete, pipe and wire revetment, gabions, bulkhead structures, and other stabilization structures. These stabilization structures are randomly placed throughout lower Mission Creek. The combination of adjacent buildings and bank stabilization has modified the natural characteristics of lower Mission Creek and its habitat. The sheltering from the wind prevents adequate mixing of the surface with deeper water, resulting in stratification of salinity and dissolved oxygen uncharacteristic of similar estuaries where man-made structures are not present (Swift 2000).

The substrate of the Mission Creek estuary varies from the sill at Yanonali Street down to the lagoon below Cabrillo Boulevard. Within the area of concern in the biological opinion, Swift (2000) characterizes the conditions as follows:

> "From this point (the railroad bridge) downstream to Chapala Street the bottom was flat, hard, carved sandstone of historical significance. The sandstone had a veneer of sand and algae in water mostly 10-15 cm (4-6 inches) deep with about 10% deeper pools to 30 cm (12 inches) deep. At Chapala, the flat sandstone bottom ends in a 30-40 cm falls into the upper end of the lagoon. On the June 8 visit the lagoon was at a higher level, standing about 15 centimeters (6 inches) above the top of the "falls" and extended 5-10 meters (16-33 feet) farther upstream. The upper lagoon has mostly rocks and gravel downstream to and beyond the Mason Street Bridge and becomes progressively less rock and more sand to the sand berm separating the lagoon from the ocean."

Tidal influence extends to a 1.5-foot high sill (Swift's "falls") which spans the entire channel at the Yanonali Street Bridge; therefore, the estuary extends from the lagoon upstream to the sill. As mentioned in the description of the proposed project, the sill at Yanonali Street probably blocks further upstream movement by the tidewater goby so that the species' distribution in Mission Creek coincides with the estuary or extends up to the Yanonali Street sill.

Swift (2000) goes on to say that the presence of rock and boulders in the area above Cabrillo Boulevard indicates that Mission Creek is "sediment-starved." He concludes that the sand and sediment in the lower estuary and lagoon must be coming from the ocean, deposited by wave action, and that the periodic breaching performed in the past by the City of Santa Barbara reduced the suitable substrate available to tidewater gobies.

Vegetation in the proposed Project area is dominated by opportunistic invasive plants such as giant reed, castor bean (*Ricinus communis*), and tree tobacco (*Nicotiana glauca*) with only remnant stands of native riparian vegetation. Salt cedar (*Tamarix* sp.), a highly invasive species, has been found in the creek channel (Service 2000a). The proposed Project area supports small patches of native vegetation including western sycamores, coast live oak (*Quercus agrifolia*), cottonwood (*Populus* spp.), and native willows (*Salix* spp.).

During the summer months, salinity levels in the estuary typically range between 20 and 30 ppt. During winter months, salinity levels are lower and at times approach completely fresh regimes. Turbidity in the estuary has been measured between 1 and 10 nephelometric turbidity units with winter months yielding the highest turbidity, as expected (Service 2000a). Bacterial contamination of Mission Creek may be the result of adjacent urbanization, homeless encampments near the creek, and birds using the lagoon. Measurements taken in 1998 show elevated levels of total coliform, fecal coliform, and enterococcus (Project Clean Water 1999). The estuary sediment closest to the ocean is composed mostly of fine and coarse sands. The estuary does not contain tidal mud flats and is devoid of estuarine vegetation.

The Santa Barbara County Parks and Recreation Department ((PRD) has manually breached the Mission Creek estuary for nearly 40 years when odors from the estuary became noxious and bacterial contamination became a concern. The PRD has not obtained federal permits for this activity. Recently, the PRD contacted the Corps to begin the permitting process for this breaching activity. The PRD has also contacted the Service to discuss ways in which the breaching could be done to minimize adverse effects to the tidewater goby.

According to Swift (2000), tidewater gobies have been known to occur in Mission Creek since 1993. In 1994, Lafferty and Alstatt (1995) observed tidewater gobies within the estuary above Cabrillo Boulevard. A tidewater goby survey was conducted in the estuary in May and June of 1999, but no tidewater gobies were captured (Service 2000b). Swift (2000) reports that he found the species in Mission Creek on May 10, 2000. These observations show that tidewater goby numbers at any given location may fluctuate from year to year, so absence in one survey year does not necessarily indicate extirpation of the population. The tidewater goby population in Mission Creek may be transient. The changing conditions of the estuary (*i.e.*, periodic drying, poor water quality, breaching of the lagoon mouth) may extirpate the population in a given year, with recolonization from nearby populations occurring in favorable years. We do not have enough data to make conclusions about the persistence of the Mission Creek population.

According to Swift (2000), the success of the tidewater goby population depends upon the amount of coarse sand substrate available for breeding. Much of the substrate suitable for breeding is in the lower portion of the lagoon, downstream of the Cabrillo Boulevard bridge. Therefore, breeding by tidewater gobies in Mission Creek is not extensive and could be greater with some changes that would enlarge the lagoon. When the lagoon is breached, suitable habitat for breeding is further reduced; at these times, tidewater gobies may be limited to the deepest pools above Cabrillo Boulevard, although breeding may not be possible in these pools because of the unsuitable substrate.

EFFECTS OF THE ACTION

The most direct adverse effect of the action would be the sequential drying of one half of the creek bed and relocation of stranded tidewater gobies. During this activity, tidewater gobies may be killed or injured from trampling by workers, crushed during the placement of impermeable barriers and dams, dessicate and suffocate in a dewatered section of the creek bed, be subject to increased predation during the drying and relocation process, or may die during the actual handling and relocation process. Additionally, as water is being pumped out of one section of the creek, tidewater gobies may be injured or killed by impingement onto the pump screen. These direct effects would only occur during construction in the estuary.

Another possible effect on the tidewater gobies would include impairment of respiration as a result of suspended sediments being released during construction and maintenance in the creek bed and on creek banks. The Corps has proposed to minimize the release of fine sediments into Mission Creek during construction by installing silt-fencing. The suspension of fine sediments during maintenance would be minimized by limiting such work to the dry season and the use of silt fencing, as needed.

Contamination of tidewater goby habitat may occur during the application of herbicides, spills and leaks from construction equipment, spills of fertilizers which may be used to augment the growth of planted vegetation, or release of buried substances during creek and creek bank excavation or removal of adjacent structures. Contamination to tidewater goby habitat may result in acute or chronic mortality, degradation of habitat through reduction in prey items, or, in the case of fertilizer releases, eutrophication. The Corps has proposed minimization measures to reduce the possibility of accidental spills of all kinds into tidewater goby habitat. These measures include timing of Project construction and sediment removal between April and October when water flow is minimal, not allowing work in flowing water unless absolutely necessary, placing silt-fencing during routine maintenance activities, using existing access points, ensuring that construction equipment is in good working order and inspected for leaks and drips on a daily basis prior to commencement of work, and developing a storm water pollution prevention plan to prevent discharges of oil or grease into the creek. Given the minimization measures, contamination of tidewater goby habitat is not likely.

The proposed Project may also disrupt the foraging base of tidewater gobies in Mission Creek which may result in a reduction of prey items. Impacts to prey items may occur as water levels are manipulated, thereby altering the hydrology of the creek and estuary. Temporary pulses of suspended sediment during construction and maintenance (*i.e.*, sediment removal) above the sill may cover and suffocate bottom-dwelling organisms. A reduction in prey items may lead to increased competition for food and a reduction in the ability of Mission Creek to support tidewater gobies. Bottom-dwelling organisms would likely begin to recover once construction is complete or during the period between maintenance actions.

We do not anticipate that the maintenance practices would adversely affect tidewater gobies. The proposed avoidance and minimization measures (*i.e.*, restricting work to low flows periods, use of silt fences) are likely to be effective at preventing sudden turbidity and contamination that could harm tidewater gobies. We do not know if past management practices in areas upstream of the estuary, which will continue unchanged under the project, had an effect on the tidewater goby or its habitat; we do not have enough data on the population to know how persistent it has been or if the estuary substrate was affected.

The Corps has included a variety of minimization measures to reduce adverse effects to tidewater gobies during construction and has incorporated structures intended to act as refugia for individuals of the species into the project design. However, the project introduces uncertainties pertaining to the long-term adverse effects on the physical structure of tidewater goby habitat:

1. The tidewater goby refugia, although novel in concept, have not yet been tested and proven to provide benefits to the species during periods of above average flow. We remain uncertain as to the beneficial effects the refugia will provide.

2. In its biological assessment, the Corps (2000) concluded that the project would result in the loss of suitable spawning habitat in the Mission Creek estuary. The Corps predicted that the proposed project would likely result in the reduction of fine sediments in the bedload and the expansion of the gravelly and rocky substrate as a result of the improved efficiency of the flood control functions upstream of the estuary. Overflow from the proposed bypass culvert would be cleaner (*i.e.*, not carrying fine sediments) and would actually remove fine sediments from tidewater goby habitat in the estuary. During discussions on February 22, 2001, the Corps stated that the shift from fine to coarser substrate in the estuary would occur only during high flows, when the bypass and the weir were functioning as intended. The Corps also stated that the influx of fine sediments may return to the estuary under normal flow conditions upstream.

   Upon revisiting Swift's (2000) report and after discussions with the Corps on April 18, 2001, we have concluded that the conversion to a gravelly and rocky substrate would only affect the tidewater goby's foraging habitat. The area of suitable spawning habitat would be unlikely to change because, according to Swift (2000), most of the fine sand and sediment which is an important component for the structural stability of tidewater goby reproductive burrows, comes from the ocean side of the lagoon and not from the flows in Mission Creek. Consequently, we conclude that the project would not substantially alter the available spawning habitat for tidewater gobies.

   The need for fine sediments should not be confused with sudden, harmful plumes of sediment that can result from construction or maintenance. These sudden siltation events may be deleterious because the water level is likely to be low and the sediments concentrated, thus suffocating both the tidewater gobies and their prey. These plumes of sediment will not contribute to the spawning habitat in the lagoon.

Based upon the information available to us regarding the likely consequences of the proposed action, the ecology of the tidewater goby, and the uncertainty of the status of the species in Mission Creek due to a lack of data, we cannot predict with certainty whether the species will persist in the Mission Creek estuary. In any case, the tidewater goby population in Mission Creek is likely to experience some change in the existing habitat conditions as a result of the project. However, Swift (2000) states that tidewater gobies would derive the greatest benefit from measures that affect water depth, salinity, and substrate in the lagoon, which is outside of the project area and would be unaffected by the Corps' proposed actions.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. We are unaware of any non-federal activities within the action area that are reasonably expected to occur.

CONCLUSION

After reviewing the current status of the tidewater goby, the environmental baseline for the action area, the effects of the proposed Project, and the cumulative effects, it is our biological opinion that the Lower Mission Creek Flood Control Project, as proposed, is not likely to jeopardize the continued existence of the tidewater goby. We have reached this conclusion because the project is unlikely to result in the permanent extirpation of the species from Mission Creek. Also, the Corps and County will implement measures to minimize adverse effects, and the quality of the spawning habitat will not be substantially affected by the project. Lastly, the tidewater goby currently occurs in approximately 85 streams and the loss of the population in Mission Creek, however unlikely, would not appreciably reduce the ability of the species to survive and recover.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act, provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary and the Corps must ensure they are implemented during any activity that it or its contractor undertakes for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps fails to adhere to the terms and conditions of the incidental take statement or fails to ensure that its contractor adheres to them, the protective coverage of section 7(o)(2) may lapse. To monitor the impact of incidental take, the Corps must report the progress of the action and its impact on the species to us as specified in the incidental take statement [50 CFR §402.14(I)(3)].

The Service anticipates that individuals of all life stages of the tidewater goby within the Mission Creek estuary, from the lagoon upstream to the Yanonali Street sill, may be taken through the combined effects of direct mortality or injury as a result of project activities, long-term modification to tidewater goby habitat upstream of Cabrillo Boulevard, and handling during removal from work areas. The exact number of tidewater gobies that could be affected cannot be predicted because of the natural fluctuations in numbers that this species experiences and the difficulty in determining how many individuals are present at any given time. Incidental take of tidewater gobies would be minimized to the extent possible during excavation, construction, and maintenance with full implementation of the avoidance and minimization measures proposed by the Corps.

REASONABLE AND PRUDENT MEASURES

The Service believes that the following reasonable and prudent measures are necessary and appropriate to minimize take of tidewater gobies:

1. The Corps shall retain the services of a qualified biologist to implement protective measures for the tidewater goby and to provide an education program to all personnel working in the estuary.

2. A qualified biologist shall be retained to conduct pre-construction surveys and to monitor the estuary to determine the status of the tidewater goby in Mission Creek after completion of the project.

3. The diversions required during construction and maintenance shall incorporate protective measures to minimize tidewater goby mortality.

The Service's evaluation of the effects of the proposed action includes consideration of the measures developed by the Corps, and repeated in the Description of the Proposed Action portion of this biological opinion, to minimize the adverse effects of the project to the tidewater goby. Any subsequent changes in the minimization measures proposed by the Corps may constitute a modification of the proposed action and may warrant re-initiation of formal consultation, as specified at 50 CFR 402.16. These reasonable and prudent measures are intended to clarify or supplement the protective measures that were proposed by the Corps as part of the proposed action.

TERMS AND CONDITIONS

To be exempt from the prohibitions of section 9 of the Act, the Corps shall comply with or ensure that its contractor complies with the following terms and conditions, which implement the reasonable and prudent measures described above and outline reporting and monitoring requirements. These terms and conditions are non-discretionary:

The following terms and conditions implement reasonable and prudent measure 1:

1. The Corps shall submit to the Service in writing, at least four weeks prior to the onset of work, the qualifications of a biologist familiar with tidewater goby biology. This biologist will be responsible for implementing measures that involve handling and relocating tidewater gobies. The Service will provide written authorization of the individual, if qualified, or denial, if unqualified.

2. The qualified biologist shall conduct a training session for all personnel associated with construction in the estuary prior to the onset of work. At a minimum, the training shall include a description of the tidewater goby and its habitat; the general provisions of the Act; the necessity for adhering to the provisions of the Act; the penalties associated with violating the provisions of the Act; the specific measures that are being implemented to conserve the tidewater goby as they relate to the project; and the boundaries of the project within which it may be accomplished.

The following term and condition implements reasonable and prudent measure 2:

3. The authorized biologist shall complete initial surveys for tidewater gobies in Mission Creek one week prior to the onset of work. After the construction phase of the project has been completed and then annually for a period of five years, a qualified biologist shall conduct surveys for tidewater gobies to determine their status. Surveys shall be conducted as follows:

    a. Monitoring surveys shall be conducted at the same time each year, the time of which will have been determined by surveys conducted prior to the onset of work, as described above.

    b. Five survey locations shall be identified for the initial survey and shall be used for the duration of the monitoring, regardless of condition of the estuary each year. The locations shall be spread within the estuary from the lagoon up to the sill at Yanonali Street.

    c. The qualified biologist shall note the conditions of the substrate in the estuary, such as its depth, relative suitability for spawning and foraging, and any other factors deemed relevant to tidewater goby habitat.

    d. The qualified biologist shall note water conditions in the estuary, including temperature, a subjective estimate of turbidity, level at the sampling locations, and subjective water quality (odor, color, litter).

e. Individuals shall be captured using standard techniques such as beach seining or dip-netting. The specimens shall be released immediately at the point of capture once they have been identified, measured, and their sex determined.

The following terms and conditions implement reasonable and prudent measure 3:

4. Because tidewater gobies are most often on the bottom of the estuary, the intake on the pumps used for water diversion shall be floated as long as possible to prevent tidewater gobies from being entrained and killed.

5. The mesh size on the pump intake shall be 1/8-inch or less. The mesh shall be checked by the qualified biologist prior to use each day and twice daily during operation to determine that it is intact. If the mesh develops holes or other conditions that impair its functioning, it shall be replaced, or repaired immediately.

REPORTING REQUIREMENTS

In addition to the information gathered pursuant to the terms and conditions above, the Corps shall provide an annual report to us on activities conducted during the year related to the project for each calender year the Corps is involved in construction and monitoring operations. The report shall contain a brief discussion of the activities completed in the previous year or planned for the next year; approximate acreage habitat within the estuary affected; occurrences of incidental take, if any; problems encountered in implementing avoidance and minimization measures and terms and conditions; recommendations for modifying the terms and conditions to enhance the protection of the tidewater goby and to simplify compliance with them; and any other pertinent information. The report shall be submitted by January 31 each year. Our office shall be notified in case of a delay. This document would assist our office and the Corps in evaluating future measures for the conservation of the tidewater goby during similar projects.

DISPOSITION OF INJURED OR DEAD SPECIMENS

Within three days of locating any dead or injured tidewater gobies, you must notify the Service's Division of Law Enforcement by facsimile at (310) 328-6399 and our office at (805) 644-1766 (2493 Portola Road, Suite B, Ventura, California 93003) by telephone and in writing. Your report shall include the date, time, location of the carcass, a photograph, cause of death, if known, and any other pertinent information.

Care shall be taken in handling injured animals to prevent additional injury. Injured animals may be released to the wild after receipt of concurrence from our office. Care shall be taken in handling dead specimens to preserve biological material in the best possible state for later analyses. Dead tidewater gobies shall be preserved in 90 or 95 percent ethanol.

The remains of tidewater gobies shall be placed with the Los Angeles County Museum of Natural History, Section of Fishes, 900 Exposition Boulevard, Los Angeles, California, 90007, (213) 763-3374; Marine Vertebrate Collection, Scripps Institute of Oceanography, La Jolla, California, 92093-0208, (619) 534-2199; or any other permitted facility authorized to receive specimens.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs federal agencies to use their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. The Corps should examine ways of ensuring that the proper amount of sediment, of the correct grain size, moves into the estuary to maintain natural conditions for tidewater gobies. The results of annual monitoring of the estuary should assist in determining whether additional sediment is needed. Maintenance schedules or practices could be adjusted to accommodate the need for more sediment, if necessary.

2. Because recolonization of watersheds by tidewater gobies is not well-documented, the Corps should coordinate with tidewater goby experts such as Camm Swift or Kevin Lafferty to determine if a capture-mark-recapture study is viable. If such a study is viable, the Corps should provide funding for a research program to determine if recolonization events are occurring at Mission Creek. Tidewater gobies in Mission Creek and in the nearest estuaries to the south and north of Mission Creek should be marked prior to winter rains and subsequently sought in adjacent drainages.

3. The Corps should work with the City of Santa Barbara to improve the quality of water in Mission Creek, especially in the lagoon. Measures which could be implemented include processing of nuisance runoff through filters to remove trash and oil and grease, locating and eliminating sources of bacterial contamination, and controlling activities adjacent to the estuary.

4. Because the genetic relationship of individual tidewater goby populations is unclear, the Corps could fund research into the genetics of the tidewater goby. This would involve removal of tissue samples from tidewater gobies in numerous estuaries and analysis of their DNA.. Such research would either solidify the evolutionary significance of populations in separate estuaries or demonstrate that genetic exchange and colonization is extensive. If genetic research shows that colonization and genetic exchange between populations is limited or non-existent, the conservation of individual populations could be important.

REINITIATION NOTICE

This concludes formal consultation on the Corps' Lower Mission Creek Flood Control Project. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

If you have any questions, please contact Rick Farris of my staff at (805) 644-1766.

Sincerely,

Ann S Bull

For Diane K. Noda
Field Supervisor

Enclosure

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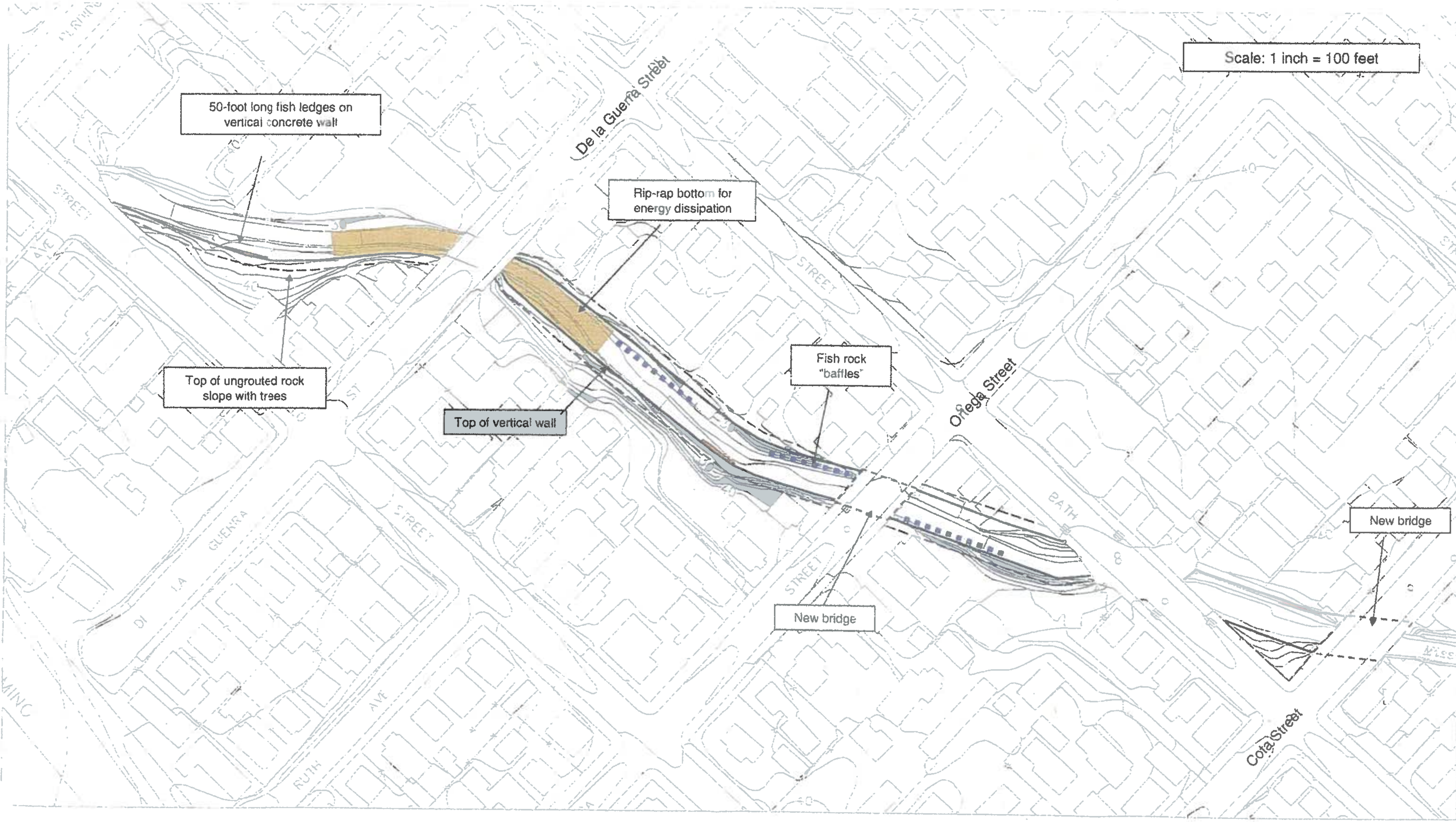
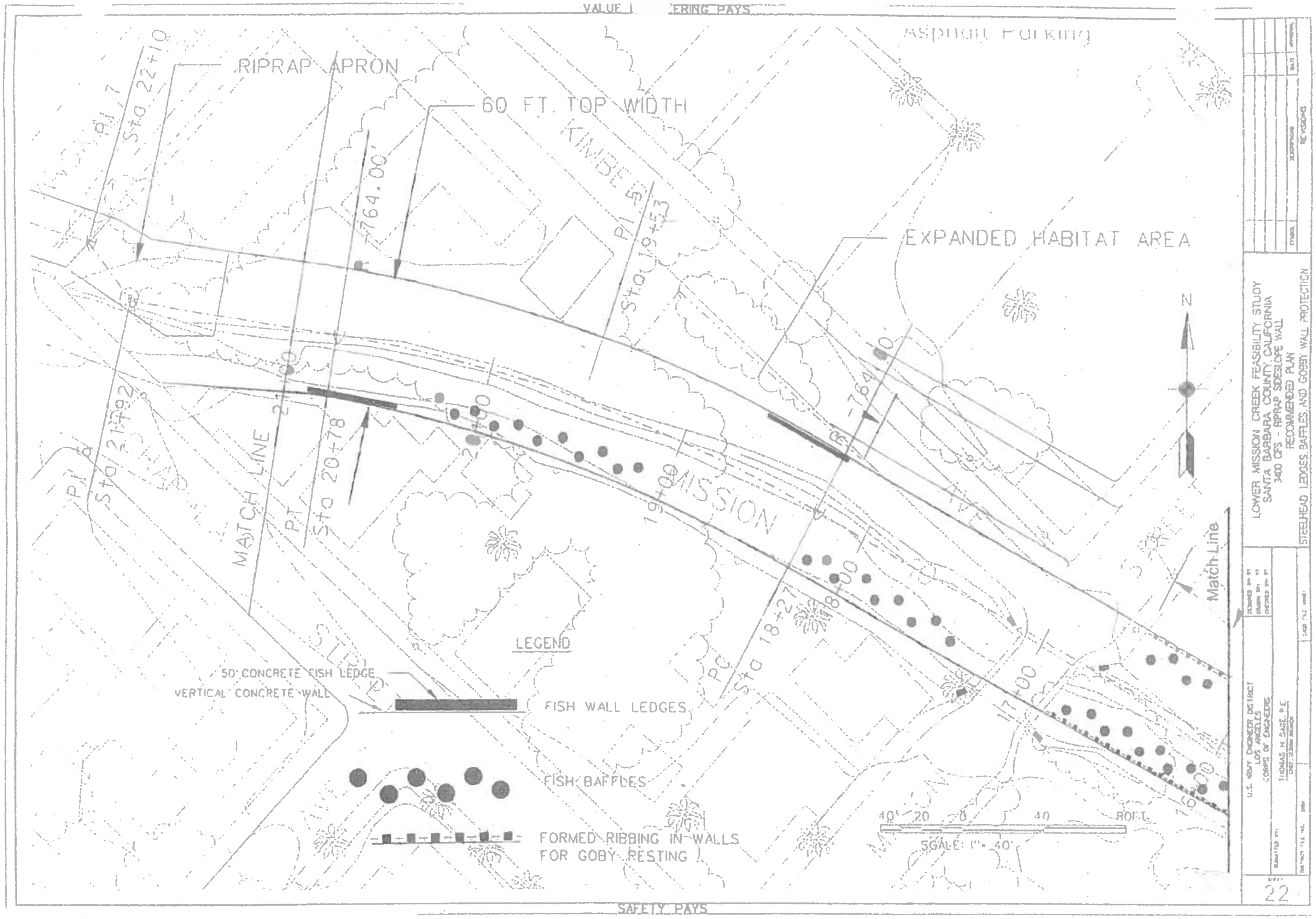


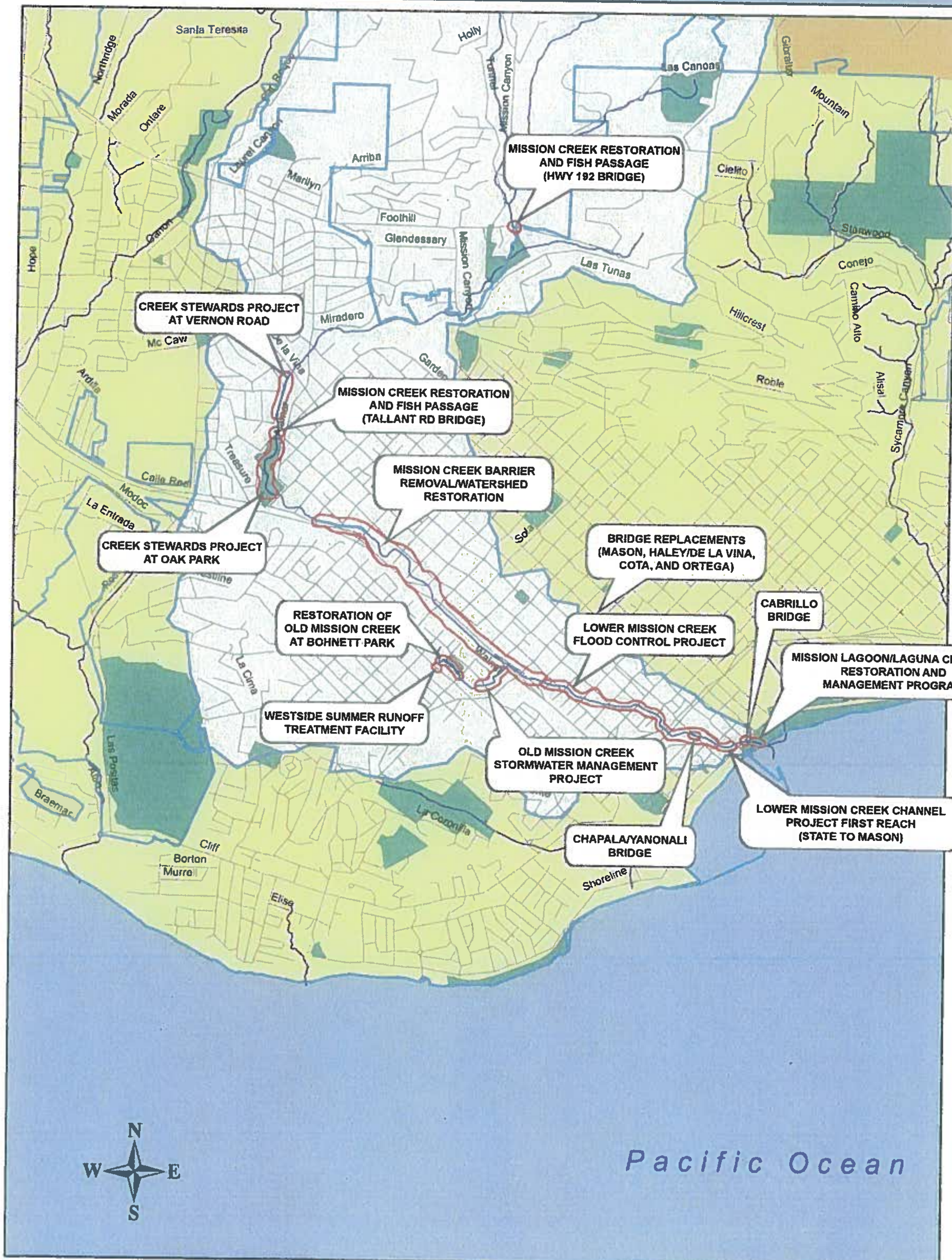
Figure 2a. Overview of New Channel Upstream of Highway 101



Source: Corps of Engineers, Lower Mission Creek Flood Control Feasibility Study, Sept. 2000

Figure 2b. Channel Improvements in Mission Creek Estuary

Mission Creek Watershed Projects

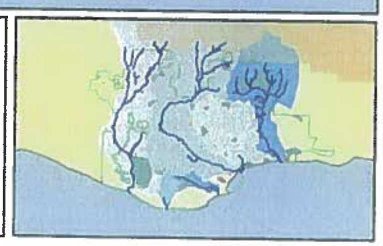


- Creek
- Parks and Open Space
- Santa Barbara City Boundary
- Los Padres National Forest

City of Santa Barbara

Mission Creek Watershed Projects

July 2010



Ventura Fish and Wildlife Office

Pacific Southwest Region

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Federally Listed Threatened & Endangered Species Which May Occur In Santa Barbara County, CA

Amphibian

Arroyo Toad	Bufo californicus	E
California Red-Legged Frog	Rana aurora draytonii	T
California Tiger Salamander	Ambystoma californiense	E

Bird

Brown Pelican	Pelicanus occidentalis	E
California Condor	Gymnogyps californianus	E
California Least Tern	Sterna antillarum browni	E
Least Bell's Vireo	Vireo bellii pusillus	E
Light-Footed Clapper Rail	Rallus longirostris levipes	E
Marbled Murrelet	Brachyramphus marmoratus marmoratus	T
Southwestern Willow Flycatcher	Empidonax traillii extimus	E
Western Snowy Plover	Charadrius alexandrinus nivosus	T
Yellow-Billed Cuckoo	Coccyzus americanus	C

Fish

Southern California Steelhead	Oncorhynchus mykiss	E
Tidewater Goby	Eucyclogobius newberryi	E
Unarmored Threespine Stickleback	Gasterosteus aculeatus williamsoni	E

Invertebrate

Longhorn Fairy Shrimp	Branchinecta longiantenna	E
Vernal Pool Fairy Shrimp	Branchinecta lynchi	T

Mammal

Giant Kangaroo Rat	Dipodomys ingens	E
San Joaquin Kit Fox	Vulpes macrotis mutica	E
San Miguel Island Fox	Urocyon littoralis littoralis	E
Santa Cruz Island Fox	Urocyon littoralis santacruzae	E
Santa Rosa Island Fox	Urocyon littoralis santarosae	E
Southern Sea Otter	Enhydra lutris nereis	T

Plant

Beach Layia	Layia carnosa	E
California Jewelflower	Caulanthus californicus	E

Contra Costa Goldfields	Lasthenia conjugens	E
Gambel's Watercress	Rorippa gambellii	E
Gaviota Tarplant	Hemizonia increscens ssp. villosa	E
Hoffmann's Rock-Cress	Arabis hoffmannii	E
Hoffman's Slender-Flowered Gilia	Gilia tenuiflora ssp. hoffmannii	E
Island Barberry	Berberis pinnata ssp. insularis	E
Island Bedstraw	Galium buxifolium	E
Island Malacothrix	Malacothrix squalida	E
Island Phacelia	Phacelia insularis ssp. insularis	T
Island Rush-Rose	Helianthemum greenei	T
La Graciosa Thistle	Cirsium loncholepis	E
Lompoc Yerba Santa	Eriodictyon capitatum	E
Parish's Checkerbloom	Sidalcea hickmanii ssp. parishii	C
Salt Marsh Bird's-Beak	Cordylanthus maritimus ssp. maritimus	E
San Joaquin Wooly-Threads	Lembertia congdonii	E
Santa Barbara Island Liveforever	Dudleya traskiae	E
Santa Cruz Island Bush-Mallow	Malacothamnus fasciculatis var. nesioticus	E
Santa Cruz Island Dudleya	Dudleya nesiotica	T
Santa Cruz Island Fringepod	Thysanocarpus conchuliferus	E
Santa Cruz Island Malacothrix	Malacothrix indecora	E
Santa Rosa Island Manzanita	Arctostaphylos confertiflora	E
Soft-Leaved Paintbrush	Castilleja mollis	E

Reptile

Blunt-Nosed Leopard Lizard	Gambelia silus	E
Island Night Lizard	Xantusia (=Klauberina) riversiana	T

E - Endangered	T - Threatened	CH - Critical habitat
PE - Taxa proposed for listing as endangered	PT - Taxa proposed for listing as threatened	PCH - Critical habitat which has been proposed

DISCLAIMER NOTICE - The information provided on this page should not be considered an OFFICIAL species list. If you have a proposed project and are in need of an official species list, please mail a detailed request to:

Ventura Fish and Wildlife Office
2493 Portola Road, Suite B
Ventura, CA, 93003.